BODY BUILDERS LAYOUT BOOK
-- E-SERIES--

WHAT'S NEW

- Updated Fuel Fill Location Requirements, see IVM
- Updated Guidelines For Modifying Wheelbases Equipped With Electronic Stability Control (ESC)

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-- E-SERIES--

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INTRODUCTION

IMPORTANT NOTICES

The information described herein is believed to be correct at the time of publication, but accuracy cannot be guaranteed. Ford reserves the right to discontinue models or change specifications or designs at any time without notice and without incurring any obligation.

Representations regarding the compliance of any Ford- manufactured incomplete vehicle to any rule, regulation or standard issued pursuant to the National Traffic and Motor Vehicle Safety Act or the Canadian Motor Vehicle Safety Act are set forth only in the Incomplete Vehicle Manual (IVM) which accompanies each incomplete vehicle.

Regulations such as those issued by the Federal Highway Administration (FHA) or issued pursuant to the Occupational Safety and Health Act (OSHA), and/or state, provincial, and local laws and regulations may require installation of additional equipment for the particular use intended for the vehicle. It is the responsibility of the subsequent stage manufacturer or completed vehicle alterer and the vehicle purchaser to ascertain how the vehicle will ultimately be used, if FHA, OSHA or state provincial or local regulations apply and how the vehicle as completed will comply with those requirements. Nothing contained herein is to be construed as a representation that such equipment required for the particular use intended has been installed on the completed or incomplete vehicle.

REFERENCE INFORMATION

Ford Body Builder Advisory Service Publications

This document is an example of a program-specific Body Builders Layout Book (BBLB) published by the Ford Body Builder Advisory Service (BBAS) team. Each Ford Commercial Truck vehicle line has a similar document that aims to provide detailed information which may be of interest to a subsequent-stage manufacturer or alterer.

The Ford Transit and Transit Connect also have a Body and Equipment Mounting Manual (BEMM), which is a comprehensive resource dedicated to body and equipment mounting information.

Yet another source of program-specific information are the “Vehicle Specification” documents available on the Ford BBAS website. Information typically found in these documents are vehicle curb and accessory weights, vehicle dimensions, component descriptions, capacities, GAWRs, alternator output, powertrain output and gear ratios.

In addition to the program-specific documents, there are several Ford BBLB documents that contain general best practices or information on specific subjects that span multiple vehicle lines. These include:

- General BBLB - contains Definitions, Design Recommendations and Vehicle Storage Guidelines.
- Snowplow BBLB
- Pickup Box Removal BBLB

These publications are updated every model year and can be accessed via the web at www.Fordpro.com/en-us/upfit/bbas/ under “Publications”. For BBLB and BEMM documents, expand the “Body Builder Layout Book” Section to view all available documents. For Vehicle Specifications, expand the “Vehicle Specifications” section. The website search function can be used to filter for specific content or vehicle line.

Ford Body Builder Advisory Service Bulletins

Occasionally, the Ford BBAS team will create an SVE “Bulletin” to address a specific issue or distribute important information in a timely manner. These documents can be accessed via the web at https://www.fordpro.com/en-us/upfit/publications/ under “Bulletins”. The website search function can be used to filter for specific content or vehicle line.

https://www.fordpro.com/en-us/upfit/publications/

If applicable, information from each SVE bulletin will be incorporated into the appropriate BBLB document the following model year. In some cases, SVE bulletins will continue to be referenced in this document.

Ford Body Builder Advisory Service Contact

The Ford Truck Body Builder Advisory Service may be consulted if questions regarding the completion of Ford commercial vehicles are not adequately addressed in the documentation described above. For assistance call (877) 840-4338 or e-mail via the web at https://www.fordpro.com/en-us/upfit/contact-us/

For Ford vehicle CAD requests, please visit https://www.fordpro.com/en-us/upfit/cad/.

For both Questions and CAD Requests, please be as specific as possible with the request details to assure the most accurate and timely response.

Ford Service Publications

Ford Service Technical Resources (including wiring diagrams, repair manuals and diagnostic tool support) are available by subscription via the Motorcraft website: www.motorcraftservice.com

The following publications are examples of digital and printed manuals which are available from Helm Incorporated; call 1-800-782-4356 or contact Helm, Inc. at their website www.helminc.com:

- Ford Truck Shop Manuals
- Ford Towing Manuals
- Ford Wiring Diagrams

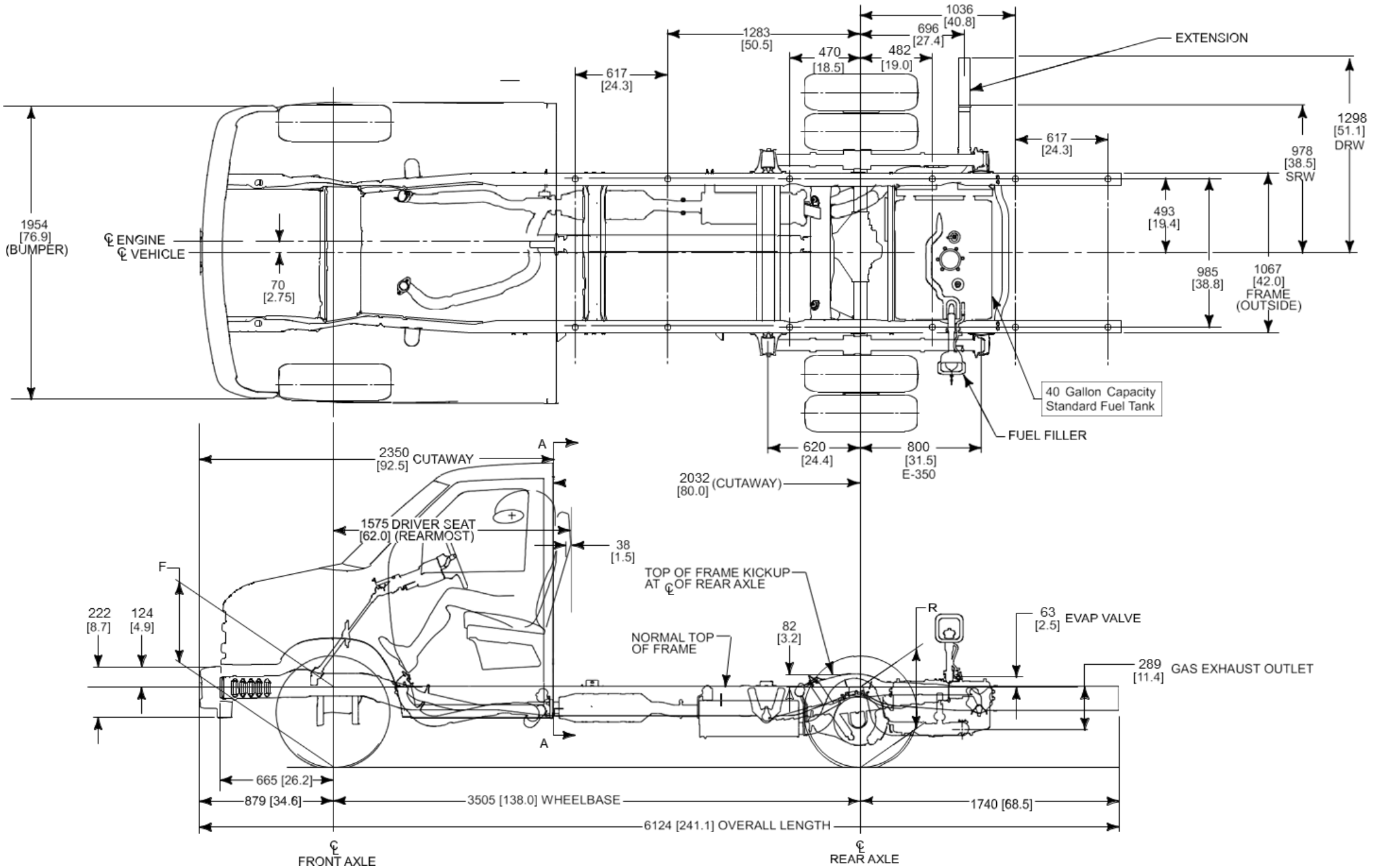
BODY BUILDERS LAYOUT BOOK
-- E-SERIES--

MODEL LINEUP

Model	WB (in.)	Engine	Trans	Maximum GVWR (lbs.)	Max Payload (lbs.)	Spring/GAWR (lbs.)(1)		Base Curb Weight (lbs.)		
						Front Range Min.- Max.	Rear	Front	Rear	Total
E-350 Cutaway	138 SRW	7.3L Premium	6R140	10,050	5,100	4,200	6,084	2,940	1,967	4,907
	138 DRW	7.3L Premium	6R140	11,500	6,270	4050-4600	7,800	3,001	2,224	5,225
	158 SRW	7.3L Premium	6R140	10,050	5,030	4,200	6,084	3,050	1,922	4,972
E-350 Cutaway	158 DRW	7.3L Premium	6R140	11,500	6,210	4200-4600	7,800	3,048	2,168	5,216
		7.3L Premium	6R140	12,500	7,210	4200-5000	7,800	3,048	2,168	5,216
	176 DRW	7.3L Premium	6R140	12,500	7,200	4200-5000	8,500	3,128	2,112	5,240
E-350 Stripped	138 DRW	7.3L Premium	6R140	11,500	6,870	4400-4600	7,800	2,470	2,071	4,541
	158 DRW	7.3L Premium	6R140	12,500	7,820	4600-5000	8,500	2,480	2,198	4,678
	176 DRW	7.3L Premium	6R140	12,500	7,760	4600-5000	8,500	2600	2,014	4,614
E-450 Cutaway	158 DRW	7.3L Premium	6R140	14,000	8,480	4,400-5,000	9,600	3,048	2,383	5,431
		7.3L Premium	6R140	14,500	8,980	5000	9,600	3,048	2,383	5,431
	176 DRW	7.3L Premium	6R140	14,000	8,480	4,400-5000	9,600	3,128	2,327	5,455
		7.3L Premium	6R140	14,500	8,980	5000	9,600	3,128	2,327	5,455
E-450 Stripped	158 DRW	7.3L Premium	6R140	14,000	9,190	4,600-5,000	9,600	2,531	2,274	4,805
		7.3L Premium	6R140	14,500	9,690	5,000	9,600	2,531	2,274	4,805
	176 DRW	7.3L Premium	6R140	14,000	9,140	4600-5,000	9,600	2,600	2,229	4,829
		7.3L Premium	6R140	14,500	9,640	5,000	9,600	2,600	2,229	4,829

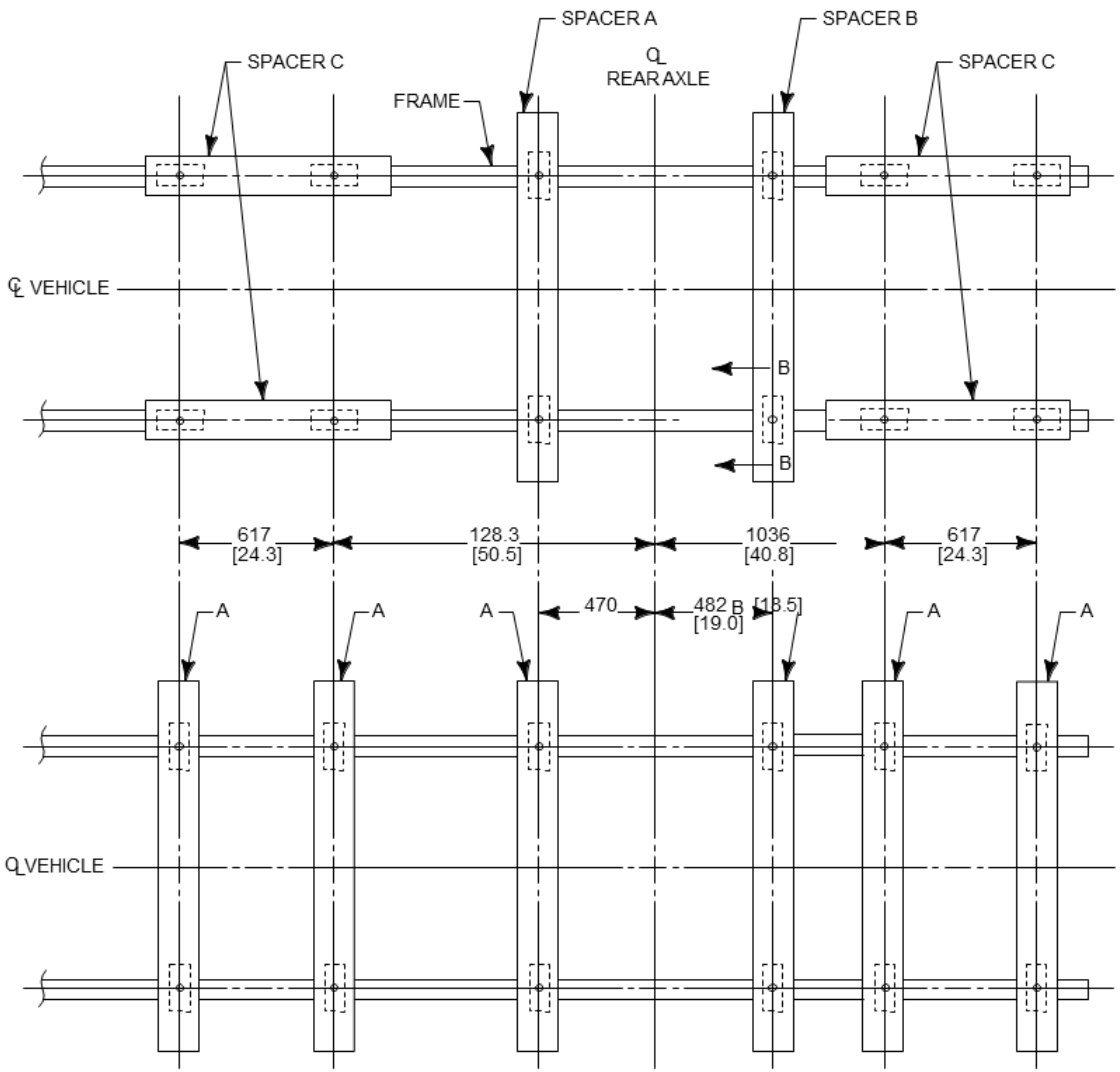
1) Gross Axle Weight Rating is determined by the rated capacity of the minimum component of the axle system (axle, wheels, tires) of a specific vehicle. Front and rear
2) GAWRs will, in all cases, sum to a number equal to or greater than the GVWR for the particular vehicle. Maximum loaded vehicle (including passengers, equipment and payload) cannot exceed the GVWR or GAWR (front or rear).

DIMENSIONAL DATA: E-350 CUTAWAY 138" WB (SRW/DRW)

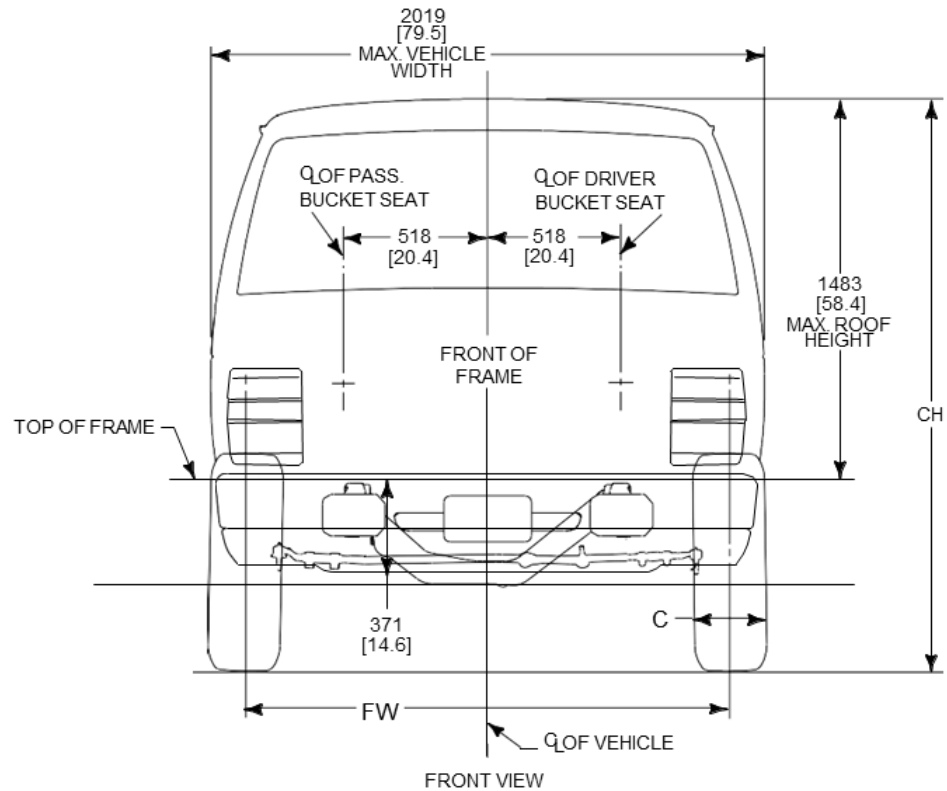


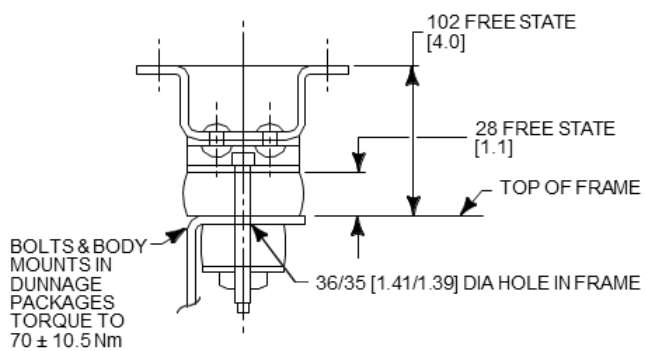
NOTE- [ ] DIMENSION ARE INCHES

DIMENSIONAL DATA: E-350 CUTAWAY 138" WB (SRW/DRW)



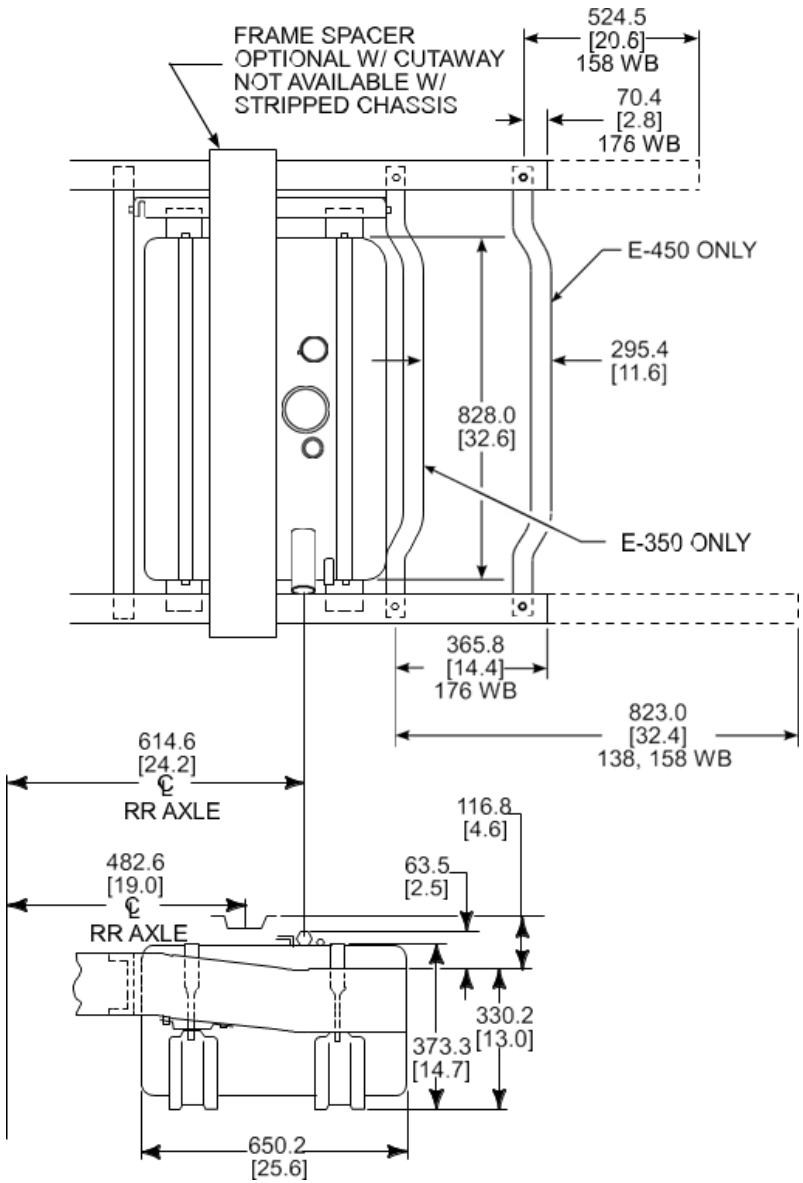
Includes 6 lateral frame spacers with 12 body mounts. Uses same frame holes for longitudinal/lateral frame spacer standard system.

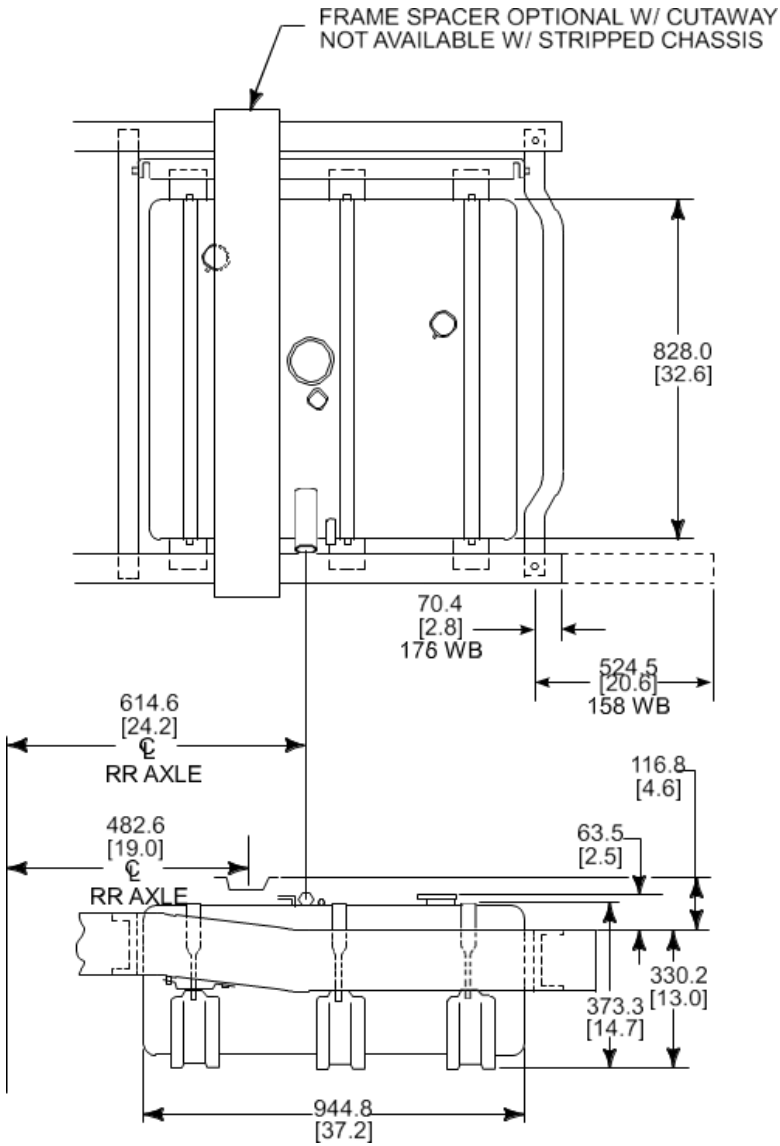



102 FREE STATE [4.0]
28 FREE STATE [1.1]
TOP OF FRAME
BOLTS & BODY MOUNTS IN DUNNAGE PACKAGES TORQUE TO 70 ± 10.5 Nm
36/35 [1.41/1.39] DIA HOLE IN FRAME

NOTE- [ ] DIMENSION ARE INCHES

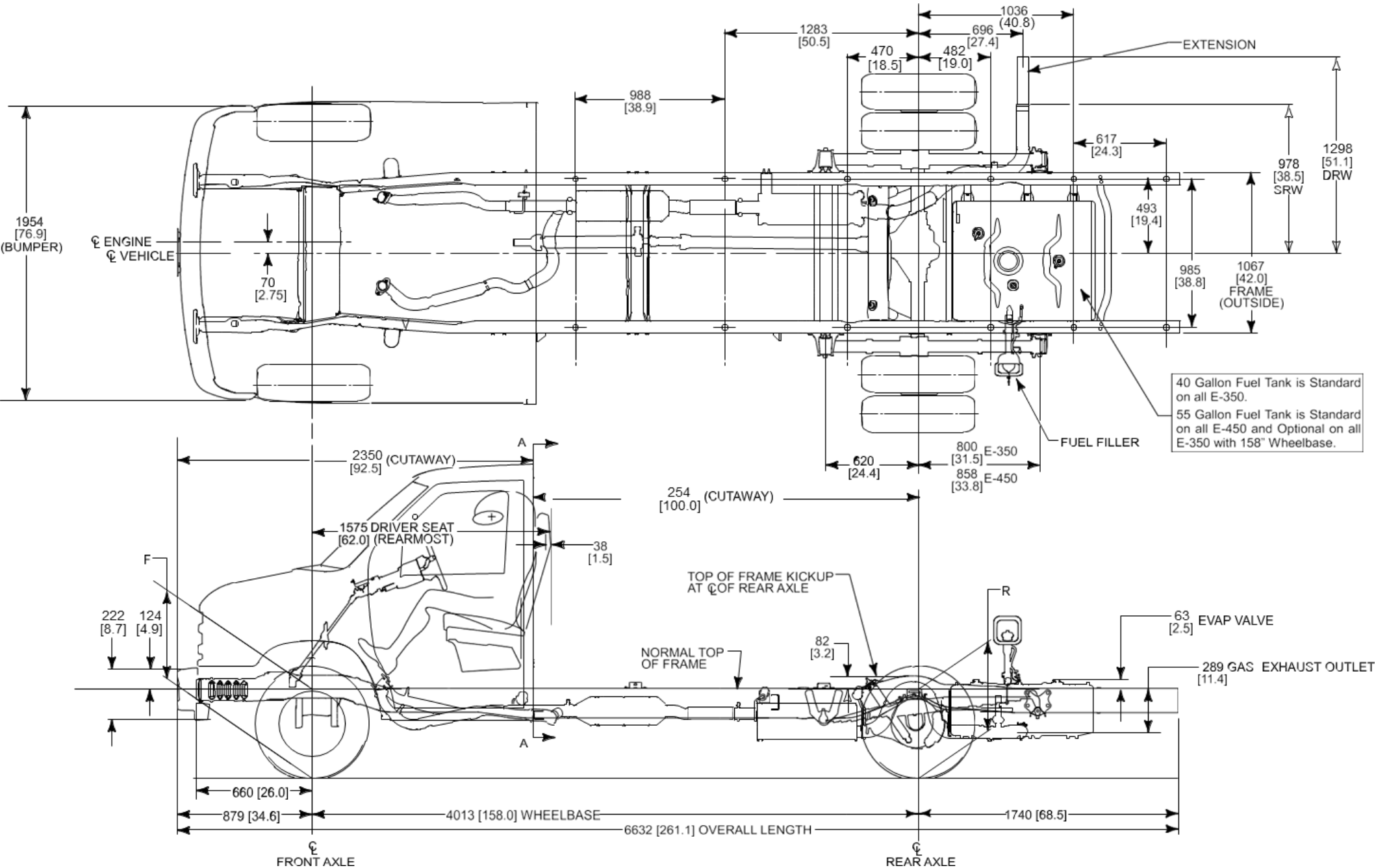
DIMENSIONAL DATA: E-350 SUPERDUTY CUTAWAY 138" WB (SRW/DRW)





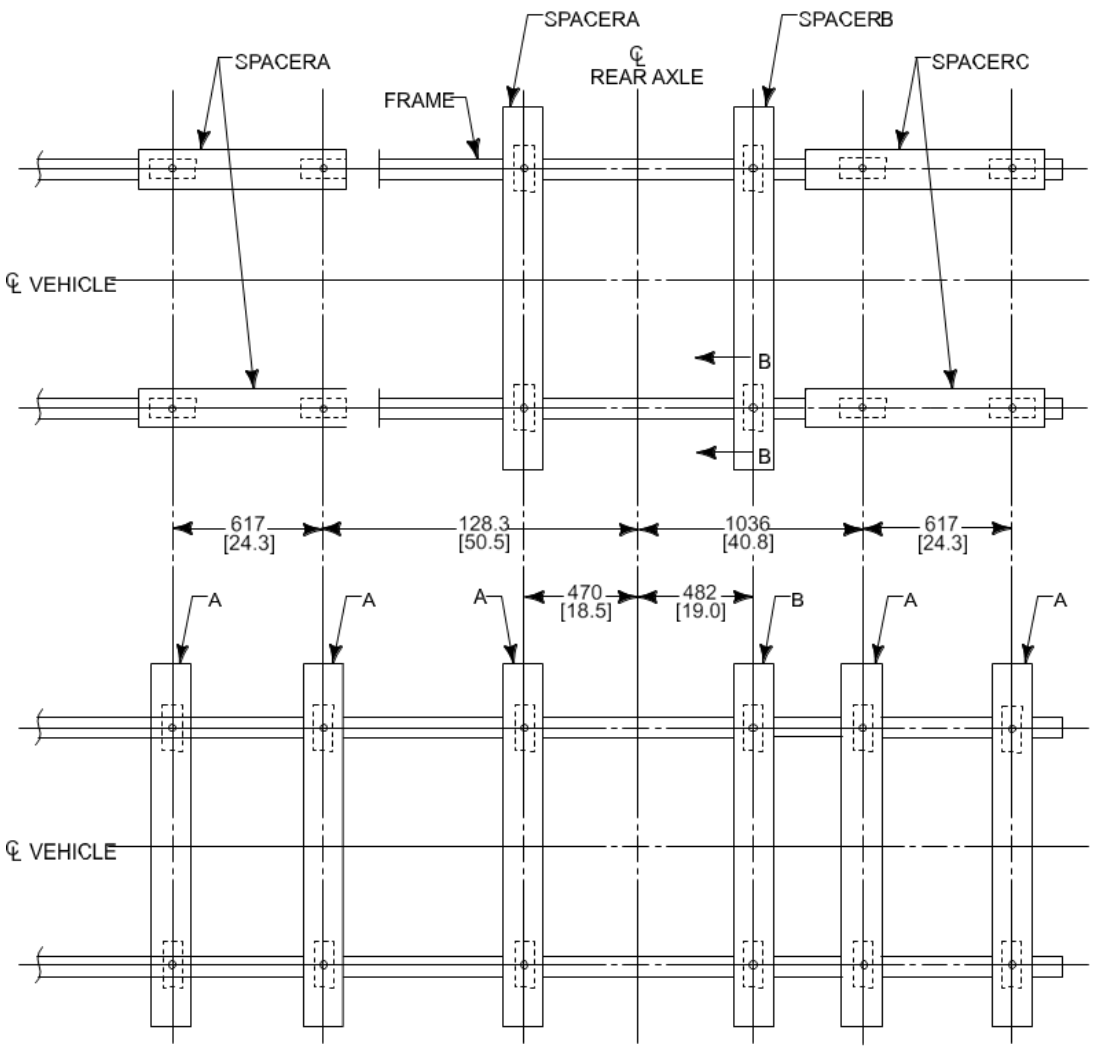
40 GALLON TANK
E-350: 138", 158", 176" WB
E-450: 158", 176" WB

DIMENSIONAL DATA: E-350/450 CUTAWAY 158"WB (SRW/DRW)

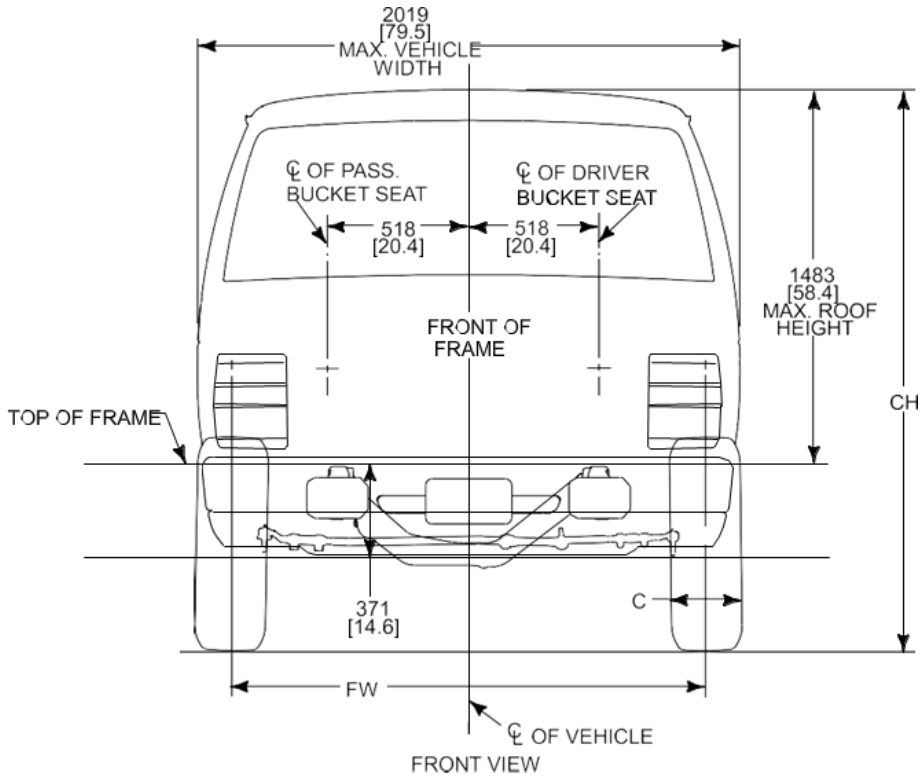


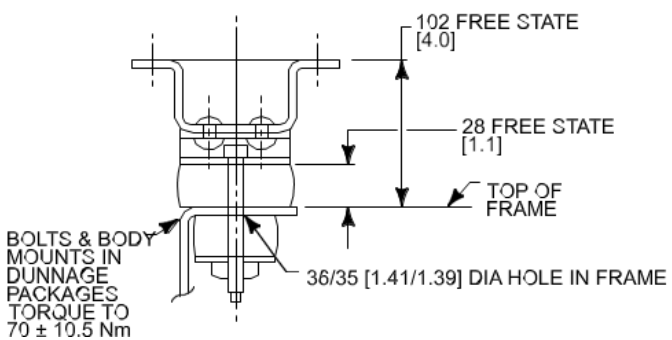
NOTE- [ ] DIMENSION ARE INCHES

DIMENSIONAL DATA: E-350/450 CUTAWAY 158"WB (DRW)



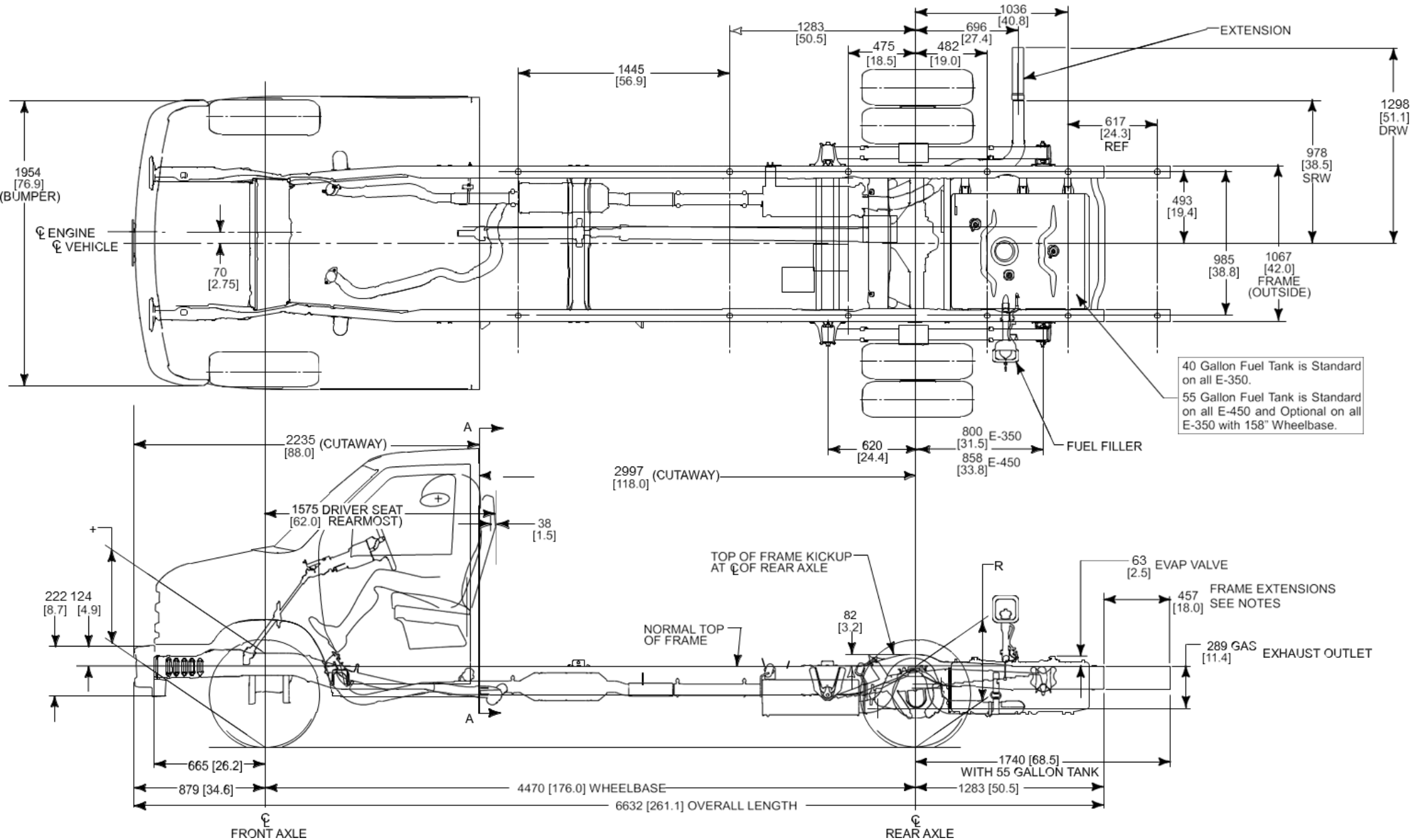
Includes 6 lateral frame spacers with 12 body mounts. Uses same frame holes for longitudinal/lateral frame spacer standard system.




102 FREE STATE [4.0]
28 FREE STATE [1.1]
TOP OF FRAME
BOLTS & BODY MOUNTS IN DUNNAGE PACKAGES TORQUE TO 70 ± 10.5 Nm
36/35 [1.41/1.39] DIA HOLE IN FRAME

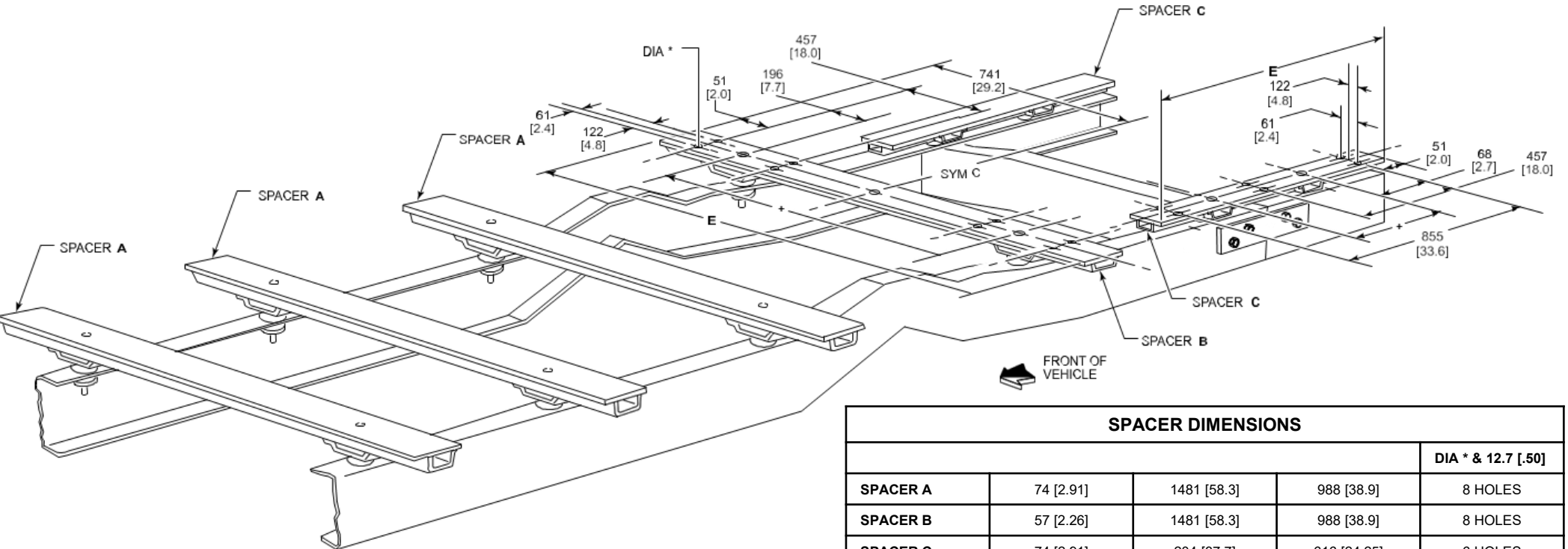
NOTE- [ ] DIMENSION ARE INCHES

DIMENSIONAL DATA: E-350/450 CUTAWAY 176" WB (DRW)

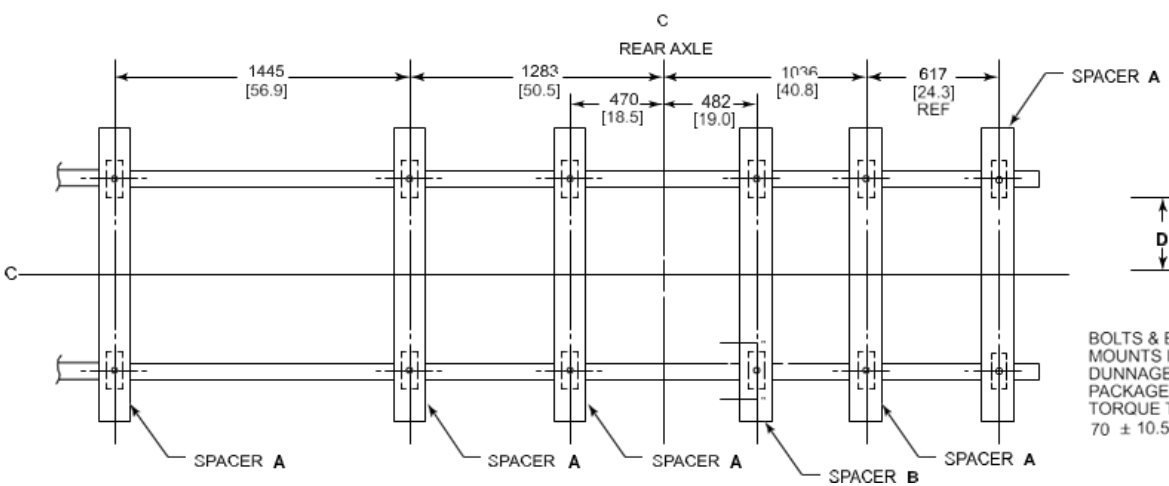


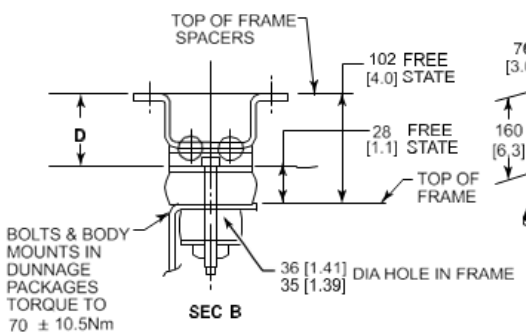
NOTE- [ ] DIMENSION ARE INCHES

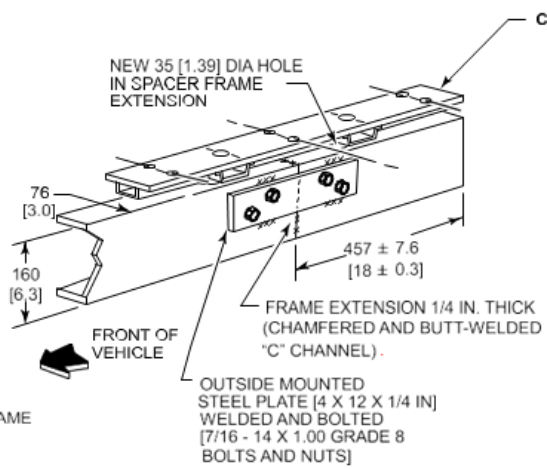
DIMENSIONAL DATA: E-350/450 CUTAWAY 176" WB (DRW)



SPACER DIMENSIONS				
				DIA * & 12.7 [.50]
SPACER A	74 [2.91]	1481 [58.3]	988 [38.9]	8 HOLES
SPACER B	57 [2.26]	1481 [58.3]	988 [38.9]	8 HOLES
SPACER C	74 [2.91]	204 [37.7]	616 [24.25]	6 HOLES

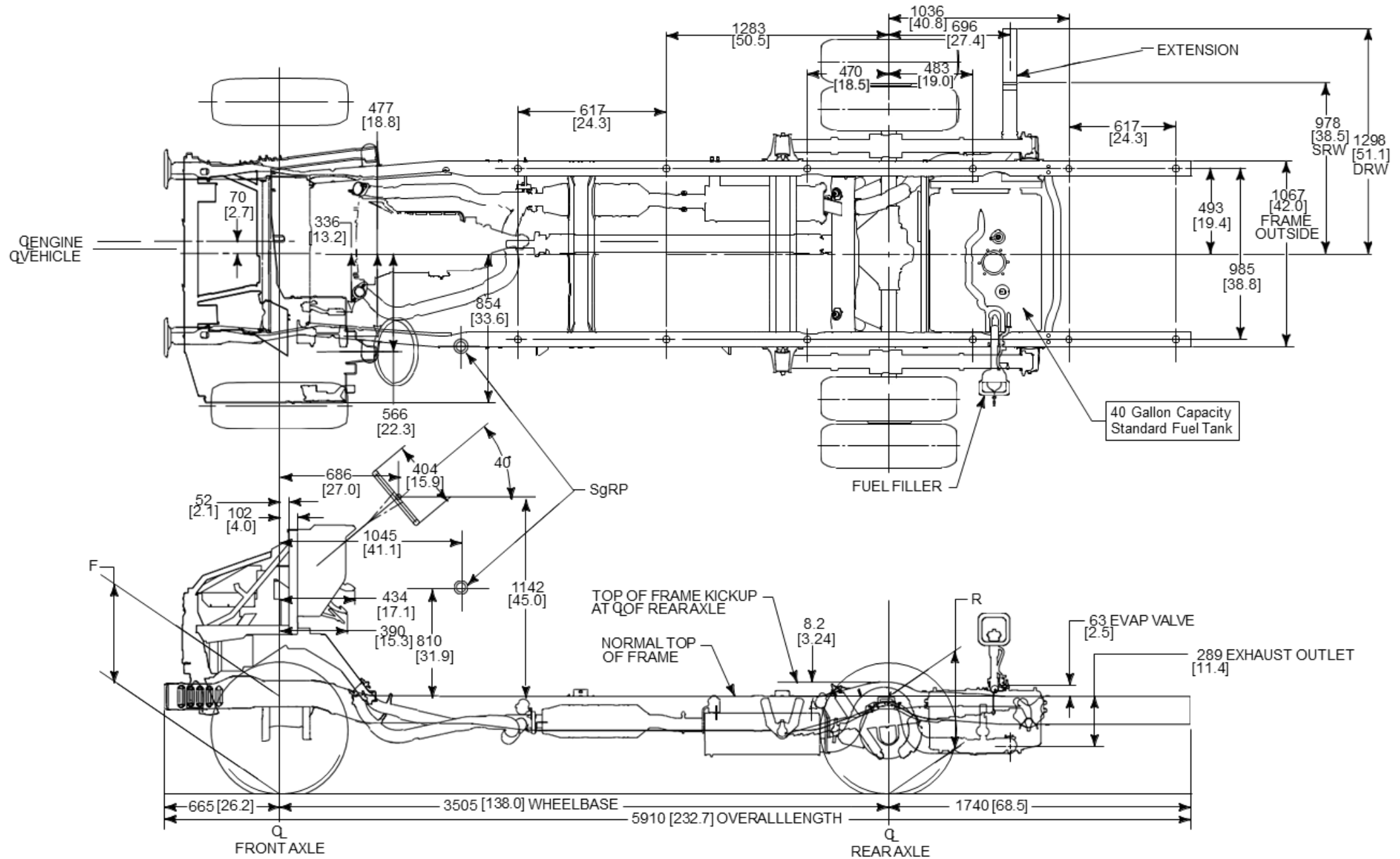






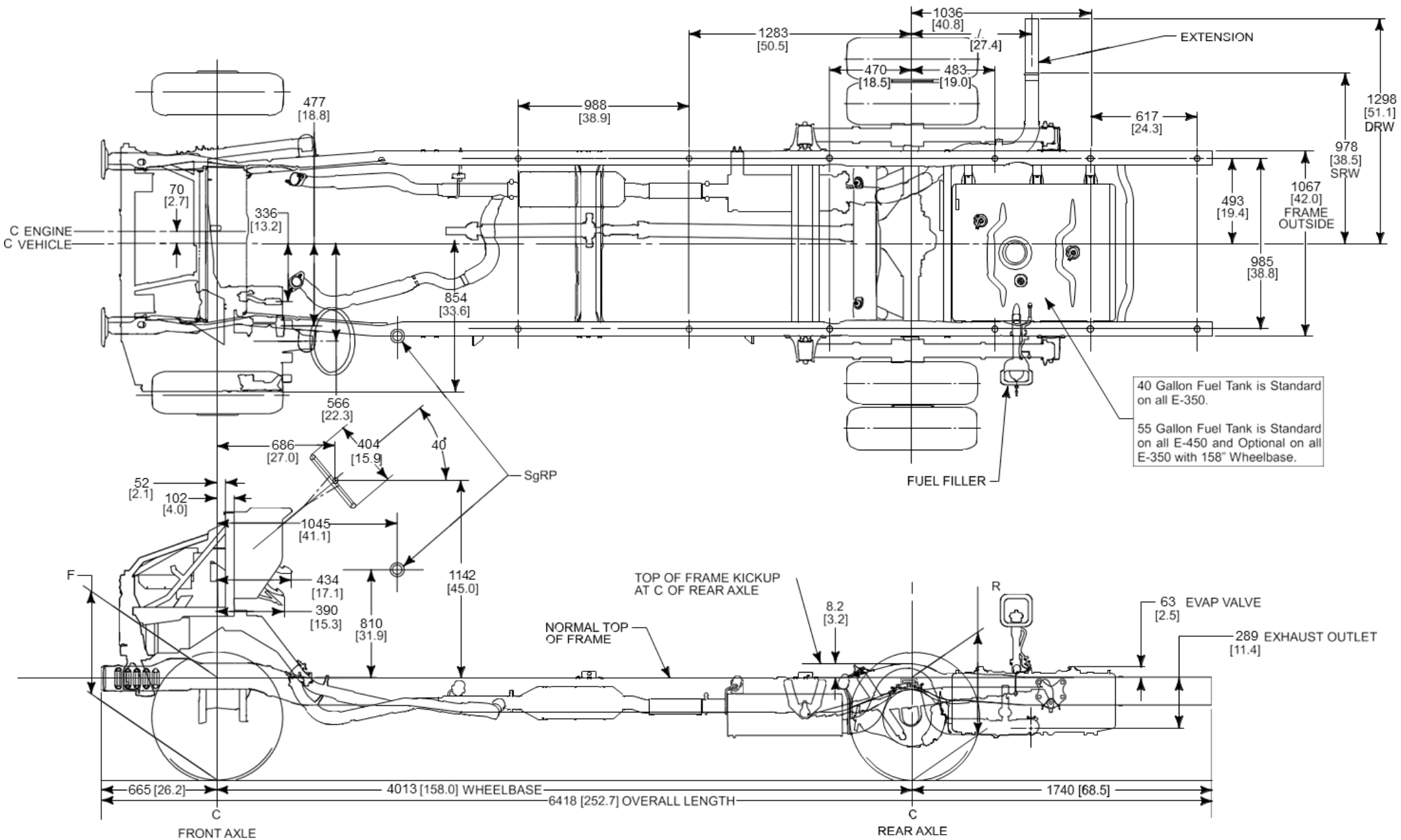
NOTE- [ ] DIMENSION ARE INCHES

DIMENSIONAL DATA: E-350 STRIPPED CHASSIS 138" WB (DRW)



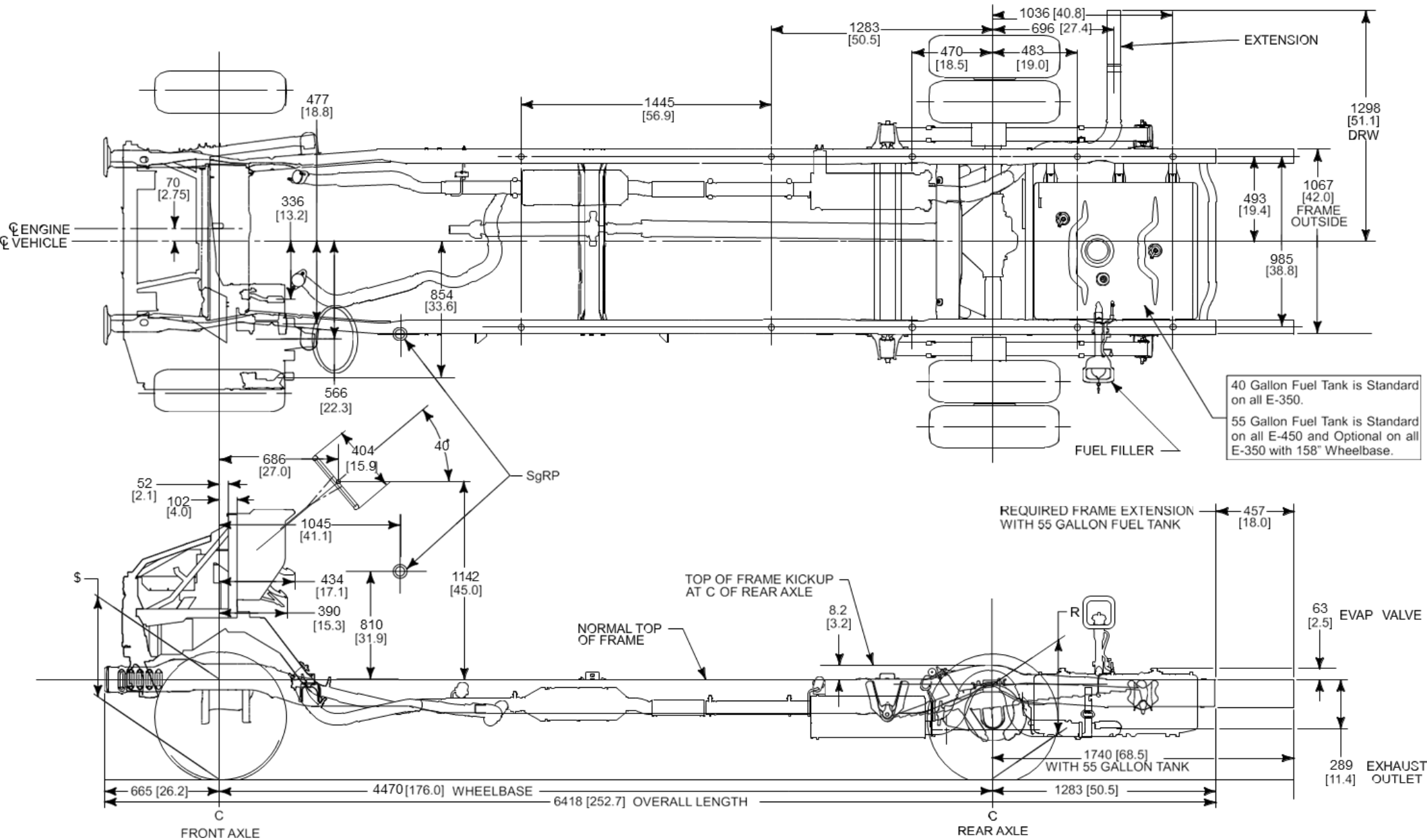
NOTE- [ ] DIMENSION ARE INCHES

DIMENSIONAL DATA: E-350 STRIPPED CHASSIS 158"WB (DRW)



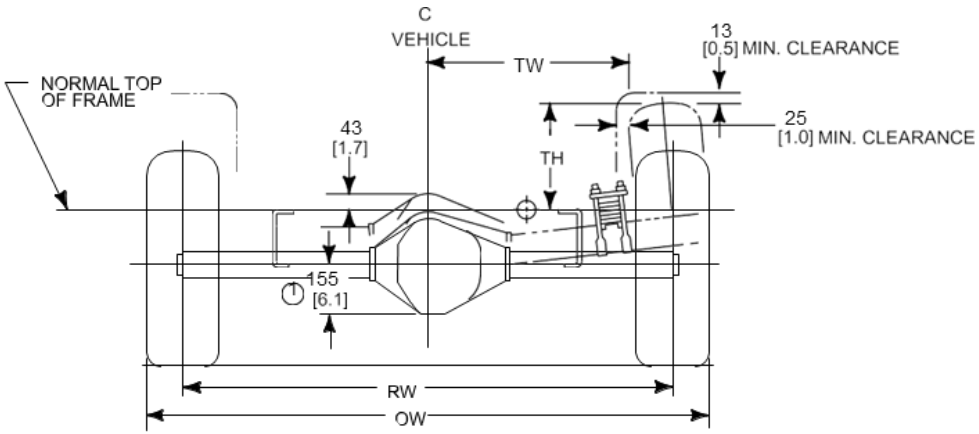
NOTE- [ ] DIMENSION ARE INCHES

DIMENSIONAL DATA: E-350/450 STRIPPED CHASSIS 176" WB (DRW)



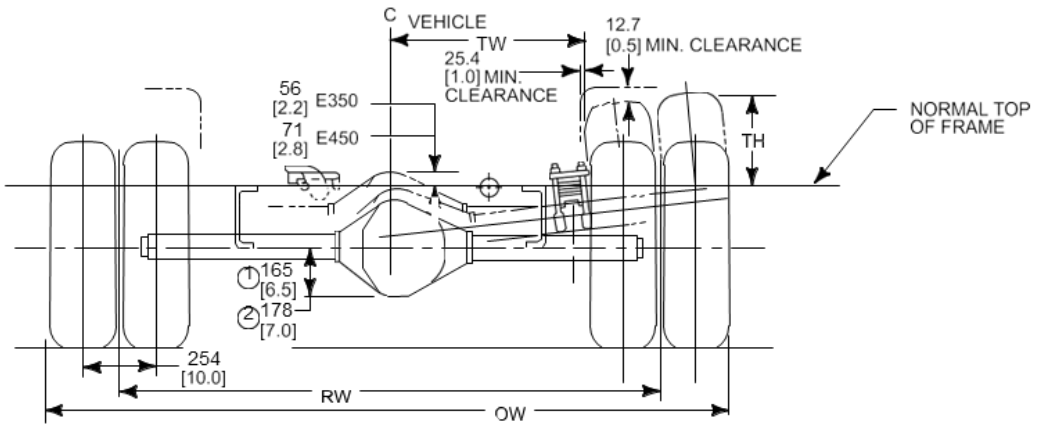
NOTE- [ ] DIMENSION ARE INCHES

AXLE / TIRE / VEHICLE HEIGHT DATA



1 7,800 LB AXLE USED AT 10,050 LB GVWR CUT-AWAY APPLICATIONS

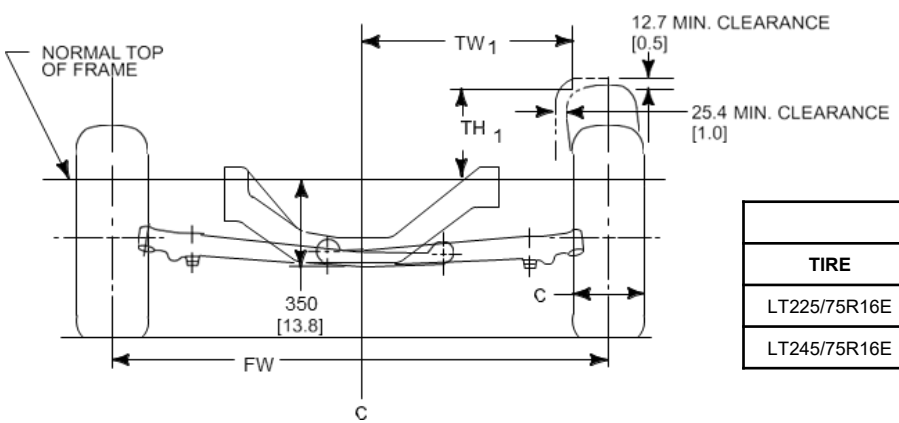
REAR SUSPENSION (SRW)
REAR VIEW



1 8,500 LB AXLE USED AT 11,500, 12,500 LB GVWR

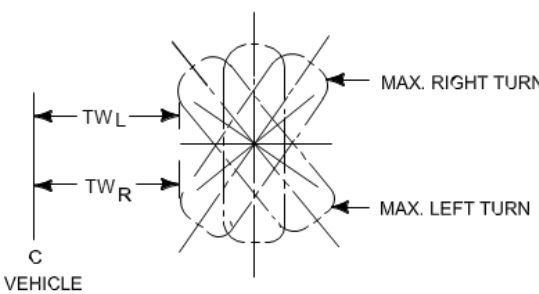
2 9,600 LB AXLE USED AT 14,000, 14,500 LB GVWR for e-450

REAR SUSPENSION (DRW)
REAR VIEW



VEHICLE
FRONT SUSPENSION
FRONT VIEW

FRONT SUSPENSION				
TIRE	TW 1	TH 1	TW L	TW R
LT225/75R16E	655 [25.8]	302 [11.9]	549 [21.6]	521 [20.5]
LT245/75R16E	655 [25.8]	320 [12.6]	549 [21.6]	521 [20.5]



PLAN VIEW
LEFT FRONT TIRE

TW – DISTANCE FROM CENTER OF VECHICLE TO SIDE OF TIRE IN MODIFIED JOUNCE.

TH – DISTANCE FROM NORMAL TOP OF FRAME TO TOP OF TIRE IN MODIFIED JOUNCE.

AXLE / TIRE / WHEELHOUSE / VEHICLE HEIGHT DATA (CONT'D)

	MODEL	WB in.	GVWR lb.	SRW / DRW	MINIMUM TIRE	FRONT GAWR MIN/MAX	COMBINED FRONT SPRING CAPACITY RATE LB.	'F' HEIGHT AT FRONT AXLE (1) BASE CURB HEIGHT mm [in.]	'F' HEIGHT AT FRONT AXLE (1) LOADED mm [in.]	REAR GAWR MAX lb.	COMBINED REAR SPRING CAPACITY RATE lb.	'R' HEIGHT AT REAR AXLE (1) BASE CURB WEIGHT mm [in.]	'R' HEIGHT AT REAR AXLE (1) LOADED mm [in]	CH OVERALL HEIGHT OF VEHICLE (STANDARD SPRINGS) (1) mm [in.] CURB	CH OVERALL HEIGHT OF VEHICLE (STANDARD SPRINGS) (1) mm [in.] LOADED
							STD SPRING	STD SPRING	STD SPRING		STD SPRING	STD SPRING	STD SPRING		
CUTAWAY	E-350 SD	138	10,050	SRW	LT245/75R16E	4,050/4,200	4,050/4,200	577 [22.7]	528 [20.8]	6084	7810	652 [25.7]	576 [22.7]	2099 [82.6]	2040 [80.3]
			11,500	DRW	LT225/75R16E	4,050/4,600	4,600	571 [22.5]	525 [20.7]	7800	8600	658 [25.9]	583 [23]	2098 [82.6]	2039 [80.3]
		158	10,050	SRW	LT245/75R16E	4,200	4,200	600 [23.6]	532 [20.9]	6084	7810	676 [26.6]	576 [22.7]	2121 [83.5]	2040 [80.3]
			11,500	DRW		4,050/4,600	4,050/4,600	572 [22.5]	525 [20.7]	7800	8600	657 [25.9]	583 [23]	2094 [82.4]	2043 [80.4]
			12,500	DRW	LT225/75R16E	4,600/5,000	4,600/5,000	591 [23.3]	523 [20.6]	8500	8600	664 [26.1]	582 [22.9]	2109 [83]	2034 [80.1]
		176	12,500	DRW		4,600/5,000	5,000	582 [22.9]	524 [20.6]	8500	8600	665 [26.2]	582 [22.9]	2100 [82.7]	2032 [80]
	E-450 SD	158	14,000	DRW		4,600/5,000	4,600/5,000	592 [23.3]	523 [20.6]	9600	9600	691 [27.2]	608 [23.9]	2118 [83.4]	2045 [80.5]
			14,500	DRW	LT225/75R16E	5,000	5,000	596 [23.5]	521 [20.5]	9600	9600	691 [27.2]	608 [23.9]	2121 [83.5]	2033 [80]
		176	14,000	DRW		4,600/5,000	4,600/5,000	586 [23.1]	521 [20.5]	9600	9600	692 [27.2]	608 [23.9]	2112 [83.1]	2042 [80.4]
			14,500	DRW		5,000	5,000	594 [23.4]	521 [20.5]	9600	9600	692 [27.2]	608 [23.9]	2116 [83.3]	2042 [80.4]
STRIPPED CHASSIS	E-350 SD	138	11,500	DRW		4200/4600	4600	608 [23.9]	524 [20.6]	7800	7800	657 [25.9]	583 [23]	- -	- -
		158	12,500	DRW		4600/5000	5000	664 [26.1]	523 [20.6]	8500	8500	751 [29.5]	582 [22.9]	- -	- -
		176	12,500	DRW		4600/5000	5000	661 [26.0]	523 [20.6]	8500	8500	751 [29.5]	582 [22.9]	- -	- -
	E-450 SD	158	14,000	DRW	LT225/75R16E	4600/5000	5000	704 [27.7]	523 [20.6]	9500	9500	760 [29.9]	608 [23.9]	- -	- -
			14,500	DRW		5000	5000	713 [28.0]	521 [20.5]	9500	9500	760 [29.9]	608 [23.9]	- -	- -
		176	14,000	DRW		4600/5000	5000	- -	522 [20.6]	9500	9500	- -	577 [22.7]	- -	- -
			14,500	DRW		5000	5000	- -	521 [20.5]	9500	9500	- -	579 [22.8]	- -	- -

(1) The Height Data shown represents dimensions of a nominal vehicle with no options. Actual height may vary due to production tolerances.

SRW – Single Rear Wheels
DRW – Dual Rear Wheels

NOTE- [ ] DIMENSION ARE INCHES

CENTER OF GRAVITY REFERENCE INFORMATION

PASSENGER LOAD (1)	
GVWR	**P (kg [lb.])**
Over 10,000 lb.	227 [500]

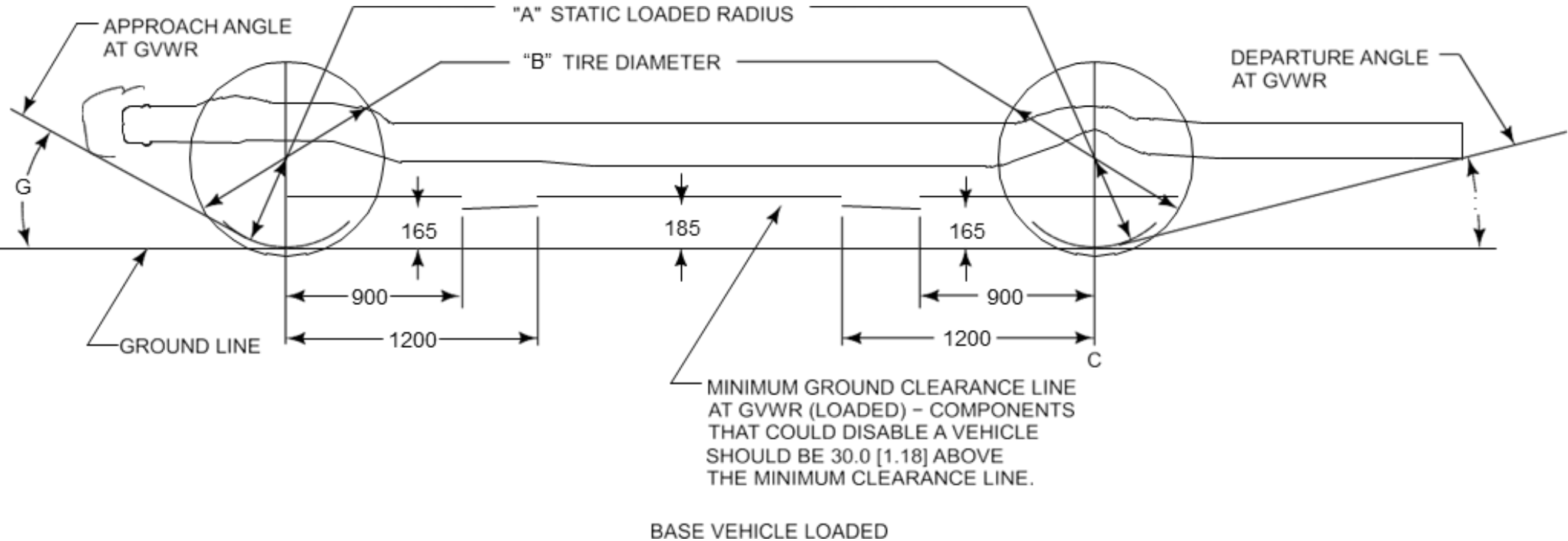
PASSENGER LOAD CG LOCATION		
Configuration	**CG_{vp} (2) (mm [in])**	**CG_{hp} (3) (mm [in])**
CUTAWAY	1095 [43.1]	1232 [48.5]

CHASSIS VERTICAL CG LOCATION (4) (mm [in])	
Configuration	**CG_{vc} (5) (mm [in])**
E-350	711 [28.0]
E-450	673 [26.5]
E-350/450 Stripped Chassis	673 [26.5]

NOTES:

1. P – Passenger Load as defined in FMVSS 105
2. CG_{vp} – Vertical CG location of Passenger Load as measured from the Ground
3. CG_{hp} – Horizontal CG location of Passenger Load as measured from the Center of the Front Wheel
4. All values should be considered estimates, if calculated CG values for the completed vehicle are close to limits stated in the applicable IVM, Ford recommends verification of CG by physical measurement of a completed vehicle.
5. CG_{vc} – Vertical CG location of Chassis as measured from the Ground
6. CG_{hl} – Horizontal CG location are no longer provided, upfitters should determine CG_{hl} based on their SUB configuration
7. Where not provided, CG_t values can be assumed at the centerline of vehicle (Y = 0)

GROUND CLEARANCE APPROACH & DEPARTURE ANGLES

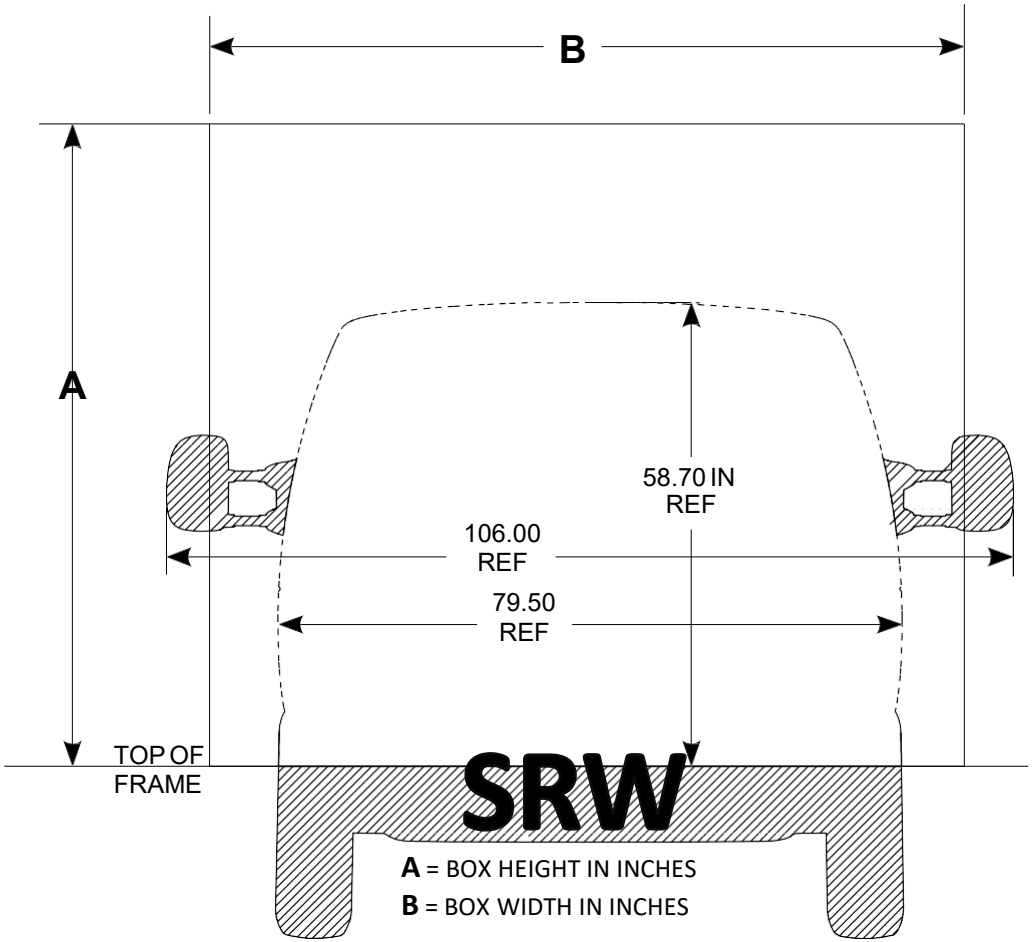


BASE VEHICLE LOADED

		ALL SEASON TIRE DATA								TREAD WIDTH				OW		TH		TW		GROUND CLEARANCE					
		A		B		C				FW		RW		OVERALL WIDTH		STD		STD		G APPROACH ANGLE			J DEPARTURE ANGLE		
	TIRE SIZE	STATIC LOADED RADIUS		MAX. DIAMETER		MAX. SECTION WIDTH		RIM WIDTH		FRONT		REAR		REAR		SPRING		SPRING		138" WB	158" WB	176" WB	138" WB	158" WB	176" WB
E-350 CUTAWAY SRW (AFT-OF-AXLE FUEL TANK)	LT245/75R16E	356	[14]	787	[31]	263	[10.4]	178	[7]	1763	[69.4]	1831	[72.1]	2094	[82.4]	307	[12.1]	710	[28]	21°	N/A	N/A	15°	N/A	N/A
E-350 CUTAWAY DRW	LT225/75R16E	346	[13.6]	757	[29.8]	236	[9.3]	152	[6]	1763	[69.4]	1915	[75.4]	2405	[94.7]	329	[13]	684	[26.9]	22°	22°	22°	15°	15°	20°
E-450 CUTAWAY DRW		346	[13.6]	757	[29.8]	236	[9.3]	152	[6]	1763	[69.4]	1974	[77.7]	2464	[97]	325	[12.8]	743	[29.3]	N/A	27°	27°	N/A	16°	21°
E-350 STRIPPED CHASSIS DRW		346	[13.6]	757	[29.8]	236	[9.3]	152	[6]	1763	[69.4]	1915	[75.4]	2405	[94.7]	329	[13]	684	[26.9]	40°	33°	34°	21°	18°	24°
E-350 STRIPPED CHASSIS DRW		346	[13.6]	757	[29.8]	236	[9.3]	152	[6]	1763	[69.4]	1974	[77.7]	2464	[97]	325	[12.8]	743	[29.3]	N/A	39°	35°	N/A	16°	18°

NOTE- [ ] DIMENSION ARE INCHES

DESIGN INFO / RECOMMENDATION: FRONTAL AREA RESTRICTIONS FOR CUTAWAY/STRIPPED CHASSIS



TO FIND FRONT SURFACE AREA IN SQ. INCHES: (A X B) + 1240.7 =

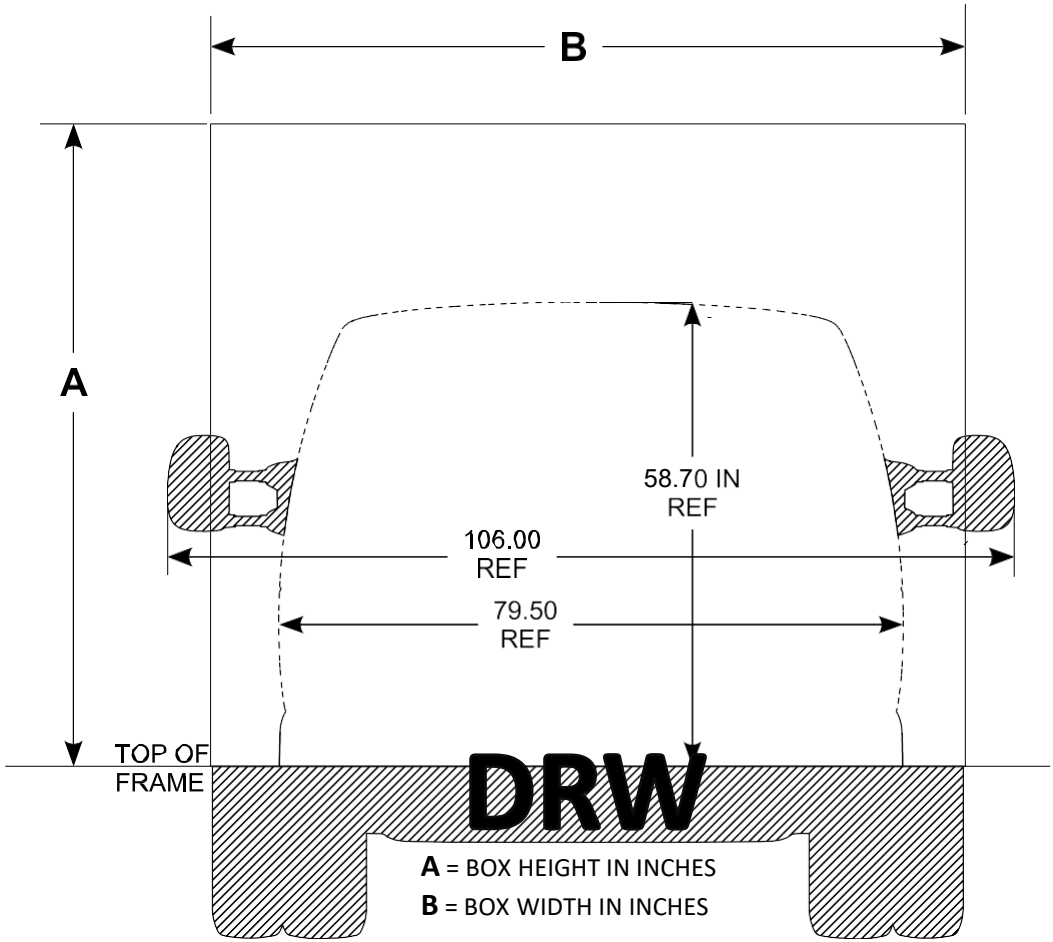
TO FIND FRONT SURFACE AREA IN SQ. FEET : ((A X B)) / 144) + 8.62 =

Note: These equations are accurate for SUBs where dimensions A and B exceed the cab height and width respectively. If that is not the case, a more detailed analysis is required to accurately determine the frontal area of the completed vehicle.

BELOW FRAME SHADED AREA = 624293 mm^2, 967.6 SQ. IN. or 6.72 SQ. FT

MIRROR SHADED AREA = 176175 mm^2, 273.1 SQ. IN. or 1.90 SQ. FT. (for both)

TOTAL SHADED AREA = 800468 mm^2, 1240.7 SQ. IN. or 8.62 SQ. FT.



TO FIND FRONT SURFACE AREA IN SQ. INCHES: (A X B) + 1632.1 =

TO FIND FRONT SURFACE AREA IN SQ. FEET : ((A X B)) / 144) + 11.33 =

Note: These equations are accurate for SUBs where dimensions A and B exceed the cab height and width respectively. If that is not the case, a more detailed analysis is required to accurately determine the frontal area of the completed vehicle.

BELOW FRAME SHADED AREA = 876808 mm^2, 1359.1 SQ. IN. or 9.44 SQ. FT

MIRROR SHADED AREA = 176175 mm^2, 273.1 SQ. IN. or 1.90 SQ. FT. (for both)

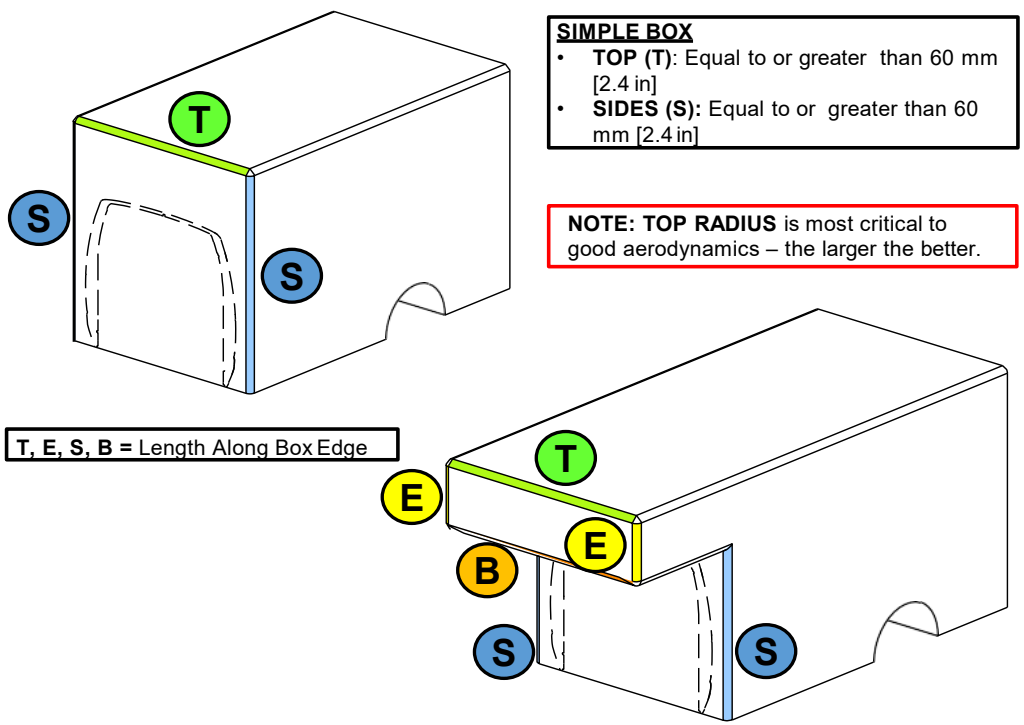
TOTAL SHADED AREA = 1052983 mm^2, 1632.1 SQ. IN. or 11.33 SQ. FT.

DESIGN INFO / RECOMMENDATION: FRONTAL AREA RESTRICTIONS FOR CUTAWAY/STRIPPED CHASSIS

All E-Series vehicles have a 7.3L Gas engine which is certified using the Heavy-Duty Engine Protocol (Dyno Cert), and therefore do not require Frontal Area or Unloaded Vehicle Weight.

Restrictions in order to meet emissions standards. However, there are Frontal Area Restrictions required to maintain optimal vehicle performance in all conditions. If the Frontal Areas in Table A are exceeded, engine output may be reduced in extreme situations to maintain safe operating temperatures. The vehicle may be completed up to the "Standard" max frontal area with no SUB radii restrictions and up to the "Enhanced" max frontal area if the radii restrictions in Figure A (for Cutaways) and Figure B (for Stripped Chassis) are followed.

CALCULATING FRONTAL AREA:
Worksheets on page 30 are provided to aid the final stage manufacturer in calculating frontal area. Total completed vehicle frontal area is calculated by taking the total frontal area of the Second Unit Body (SUB) and adding the frontal area of the chassis below the top of frame and the mirrors (Shaded area on the worksheet). The final vehicle manufacturer will need to account for all aftermarket mirrors, equipment and second unit body areas.



SIMPLE BOX
- **TOP (T)**: Equal to or greater than 60 mm [2.4 in]
- **SIDES (S):** Equal to or greater than 60 mm [2.4 in]

NOTE: TOP RADIUS is most critical to good aerodynamics – the larger the better.

T, E, S, B = Length Along Box Edge

BOX EXTENSION OVER CAB
- **TOP (T)**: Equal to or greater than 60 mm [2.4 in]
- **All SIDES & BOTTOM of EXTENSION (S,E,B):** Average Edge Radius to be equal to or greater than 60 mm [2.4 in]

(R**n** = radius of box edge "**n**")

$$\textbf{AVERAGE EDGE RADIUS} = \frac{2E * Re + 2S * Rs + B * Rb}{2E + 2S + B} \geq 60mm\ [2.4\ in]$$

FIGURE A – SECOND UNIT BODY RADII RESTRICTIONS FOR COMPLETED CUTAWAYS

TABLE A - FRONTAL AREA RESTRICTIONS FOR COMPLETED CUTAWAYS AND STRIPPED CHASSIS

ENGINE	FINAL DRIVE RATIO	STANDARD MAX. FRONTAL AREA (NO SUB RADII RESTRICTIONS) ft²	ENHANCED MAX. FRONTAL AREA (WITH SUB RADII RESTRICTIONS)[1] ft²
7.3L PREMIUM	4.10	79	86
	4.56	82	89

(1) For vehicles completed with Frontal Area larger than the Standard Max value, radii restrictions shown in Figure A for Cutaways and Figure B for Stripped Chassis will be necessary to maintain optimal vehicle performance

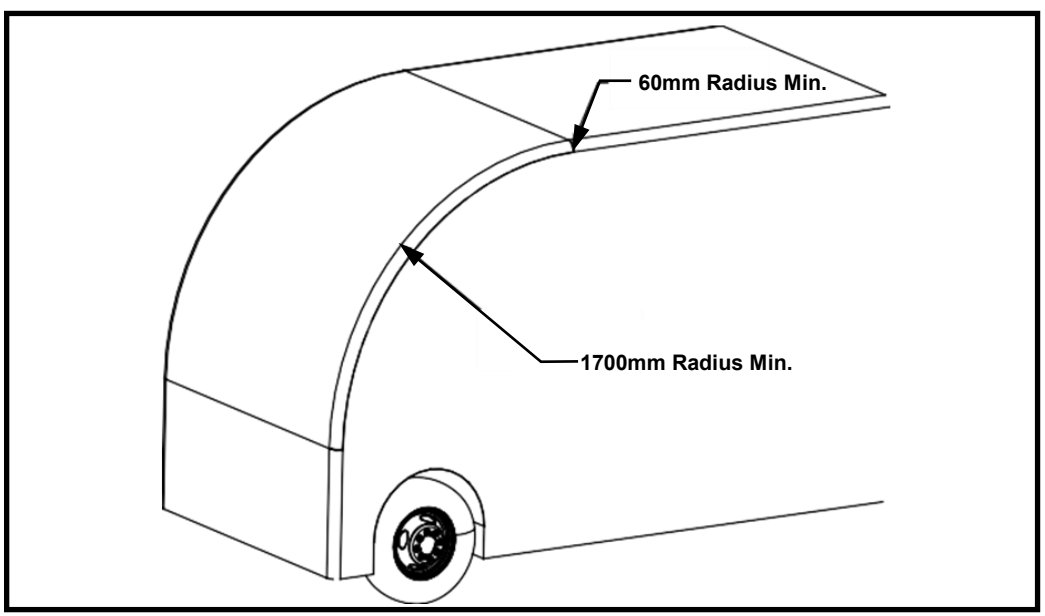
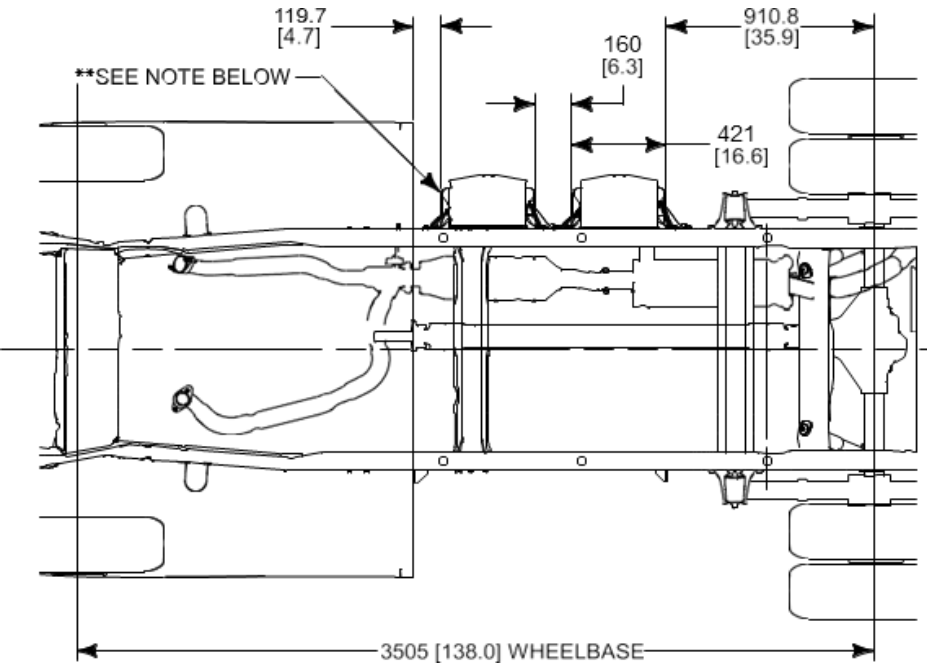
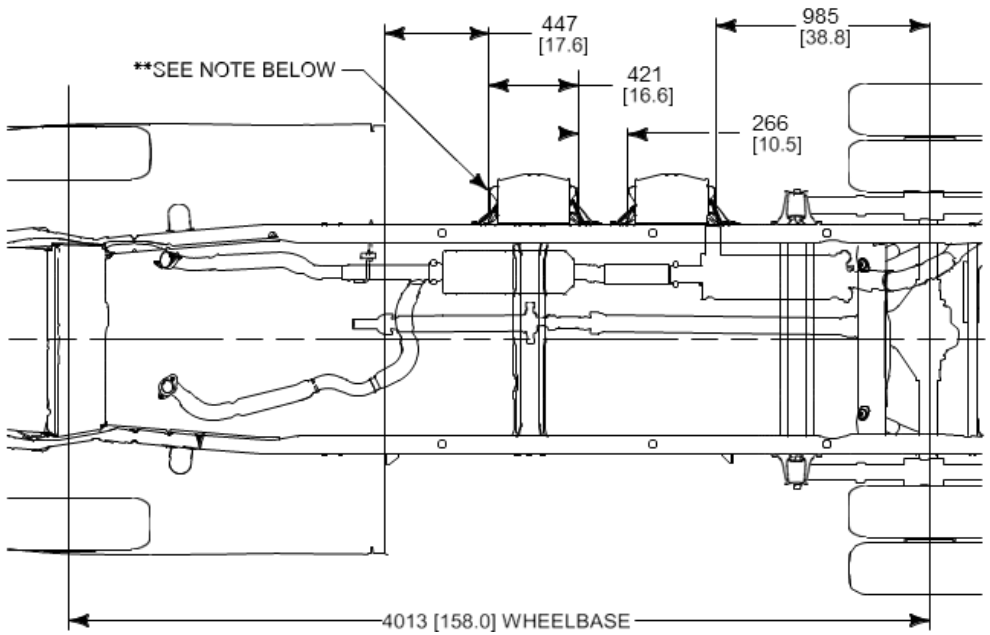
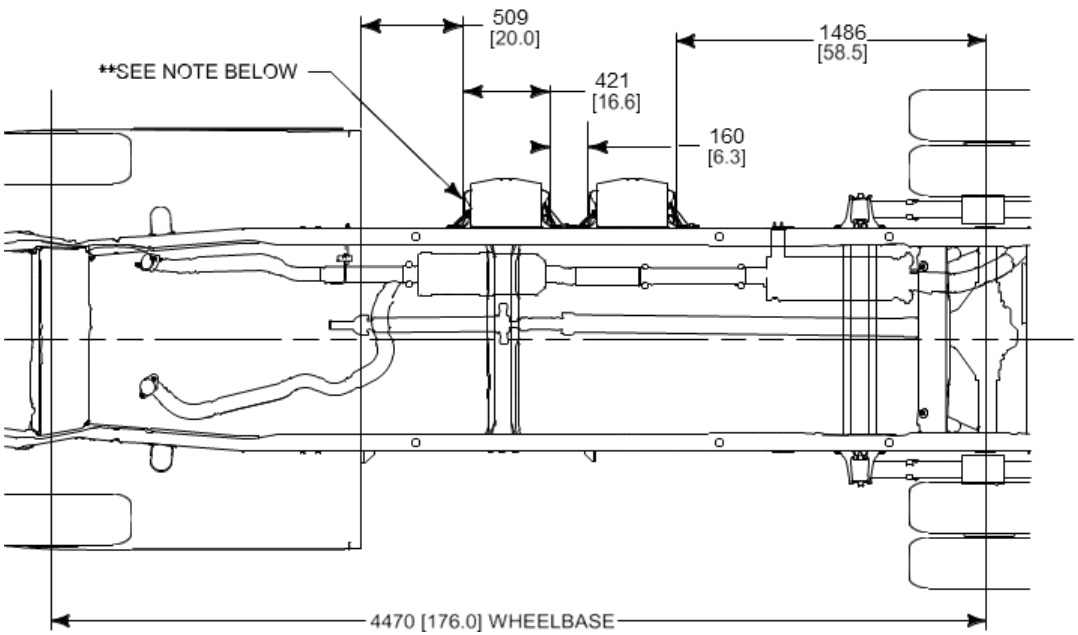


FIGURE B – SECOND UNIT BODY RADII RESTRICTIONS FOR COMPLETED STRIPPED CHASSIS

BATTERY BOX LOCATIONS: E-350/450 DUAL BATTERIES & GASOLINE W/ AUX. BATTERY







NOTE: The following guidelines must be followed when repositioning the battery box.

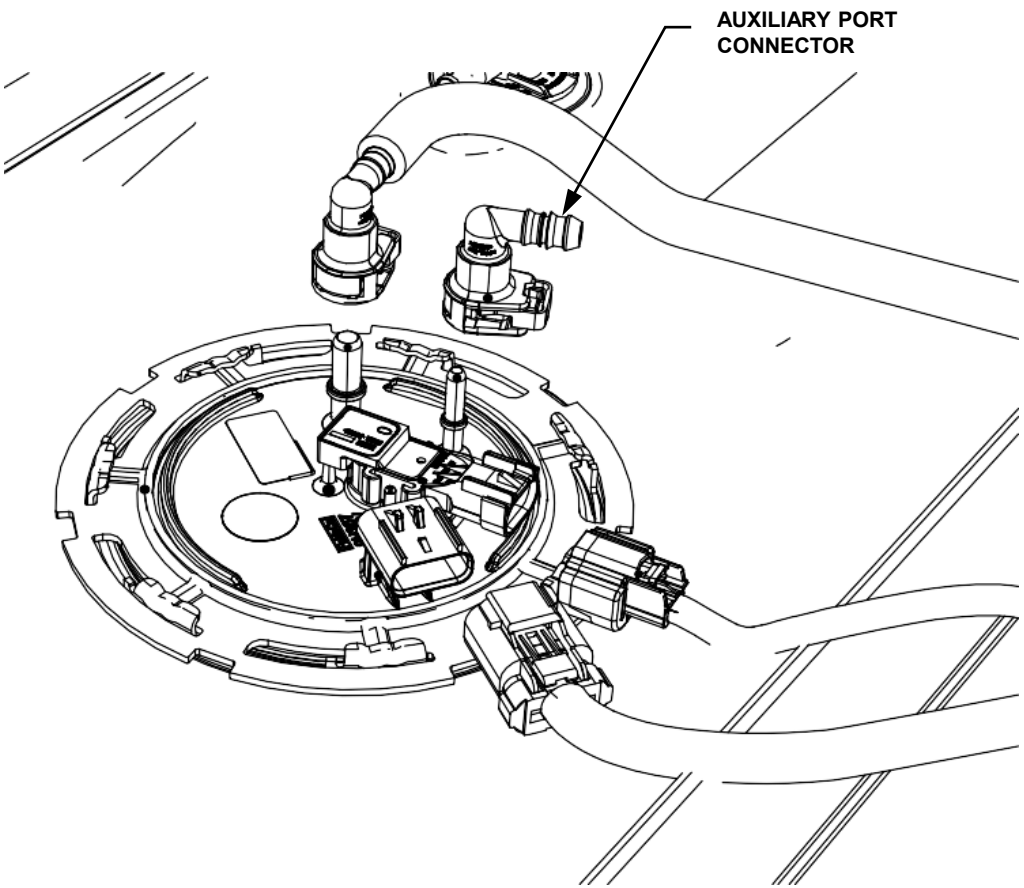
- Maintain attachment hole diameter of 12 mm.
- Maintain use of existing OEM bolts – M10
- The battery box must not be packaged any lower in vehicle position than is provided by Ford
- All new frame holes must be at least 1x hole diameter away from all other holes & 1-½ diameter away from the edge of a radius tangent.
- Battery boxes may not be moved rearward of position provided by Ford.

FUEL SYSTEM: AUX FUEL PORT CONNECTOR KIT/ FUEL PUMP DRIVER MODULE

To use the auxiliary fuel port on the E350-450 Chassis Cab aft- of-axle Fuel tank, a service kit can be obtained from your local Ford dealership parts department

Aux Fuel Port Service Kit Number: **9C2Z-9B210-A**

The Kit includes a quick connector, a clamp and tag. Install this kit to allow installed equipment (such as a generator) to use fuel from the vehicle fuel tank.

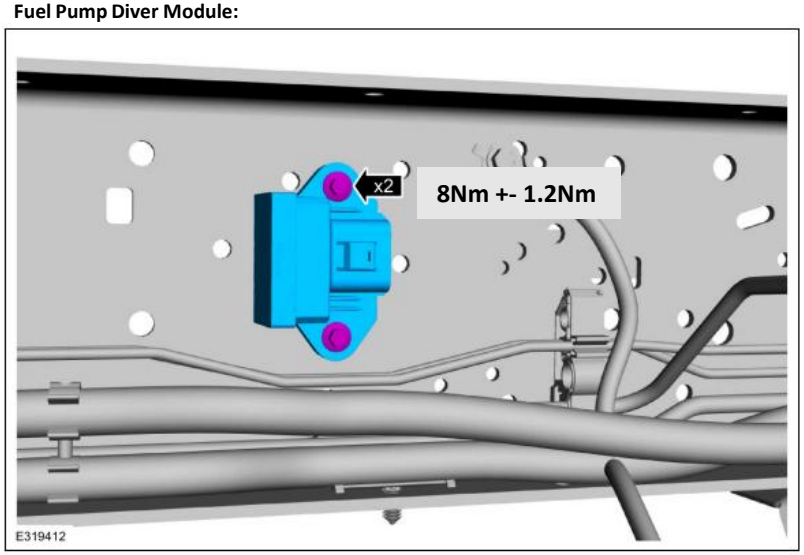


All E-Series Chassis Cab aft-axle fuel tanks come equipped with an Auxiliary Fuel Port located in the fuel sender unit on the top of the fuel tank. These Aux Fuel Ports can provide a fuel supply to Upfitter-installed equipment such as generators.

Model	Fuel Tank Capacity *	
	40 Gallon	55 Gallon
	Remaining Fuel Volume (Gallons) at Auxiliary Fuel Tube Shut-off	
E-SERIES (Gasoline)	5.7	7.8

* Fuel volumes are estimated

Fuel Pump Diver Module:



Note: If removed, reinstall to the values shown. Do not over torque.

DESIGN INFO / RECOMMENDATION: SECOND UNIT BODY (SUB) MOUNTING GUIDELINES - CUTAWAY

SUB TO FRAME MOUNTING TECHNIQUES FOR CUTAWAY MODEL

TECHNIQUE #1 - Use of Frame Isolators (also known as Frame Pucks) - Preferred Method

- Ford provides optional SUB mounting isolators (available as a standalone option and included in the "standard pattern" and "alternate lateral" frame spacer options) which will provide the SUB with some vibration and noise isolation from the frame. The SUB should be attached to these isolators using all the provided locations with the provided fasteners if possible. If alternate bolts are used, they should be M12 PC10.9, and should not extend more than 25.4 mm [1.00 in] below the bottom of the isolator. Fastener torque should be 70 +/- 10.5 Nm.
- The Ford provided rubber isolators are capable of 19.0 mm [0.75 in] movement from a static (design) position, which is the same for the isolators that mount the cutaway body to frame. This will minimize squeaks, rattles and water or air leaks at the mounting surface of the SUB, to the cutaway body. The Ford optional isolators and frame spacers will accommodate the recommended fuel fill neck installation and a recommended 101.6 mm [4.00 in] minimum clearance between the frame and the bottom of the SUB (except at the rear axle kick-up area).
- Vehicles not equipped with the Ford optional spacers have 12x 34.8 mm [1.37 in] diameter holes on the upper flange of the frame side members for mounting of aftermarket body to frame isolators. The density / durometer, size and quantity of these isolators should be based on the SUB weight plus the projected payload of the completed vehicle, within the limits of the GAWRs and GVWR, as determined by the final stage manufacturer. If not already provided by Ford, heat shields may be required for the first two locations behind the cab on RH side to protect the isolators from exhaust heat.
- More information regarding optional frame isolators, optional spacer packages and location of mounting holes can be found in the "Dimensional Data" section of this BBLB.

TECHNIQUE #2 - Use of Shear Plates w/ Longitudinal Frame

DO NOT WELD SHEAR PLATES TO OEM FRAME

- Front Shear Plate Attachment: Use two bolts, nuts, and washers in the OEM frame, one bolt, nut and washer with a ¼" equivalent weld bead around three sides of the shear plate and the SUB-mounting frame, skip-welded at the shear plate corners. If front shear plate is not welded to the SUB-mounting frame, two bolts should be used instead of one. **SEE FIGURE A**
- Rear Shear Plate Attachment: Use three bolts, nuts, and washers in the OEM frame, one bolt, nut and washer with a ¼" equivalent weld bead around three sides of the shear plate and the SUB-mounting frame, skip-welded at the shear plate corners. If rear shear plate is not welded to the SUB-mounting frame, two bolts should be used instead of one. **SEE FIGURE A**

TECHNIQUE #3 - Use of Shear Plates w/ Cross Frame

DO NOT WELD SHEAR PLATES TO OEM FRAME

- Front Shear Plate Attachment: use two bolts, nuts, and washers in the OEM frame, two bolts, nuts and washers in the SUB-mounting frame. **SEE FIGURE B**
- Rear Shear Plate Attachment: use three bolts, nuts, and washers in the OEM frame, two bolts, nuts, and washers in the SUB-mounting frame. **SEE FIGURE B**

NOTES for Technique #2 and #3:

- A spacer between the OEM frame and SUB frame should be used for longitudinal SUB frame, secured in such a manner as to maintain retention during installation and operational use. The spacer should have a slight taper which starts at the front of the SUB frame. SEE FIGURE C
- Front Shear Plates should be angled forward approximately 45 to 60 degrees from the horizontal. Front Shear Plates should be a sufficient distance from the front of the SUB to allow for frame flexing, i.e., Front Shear Plates should be placed behind the tapered section of the spacer.
- U-bolts must be installed every 2-3 feet between the front and rear shear plates.
- Vertical spacers must be used between the upper and lower frame flanges at each U-bolt to prevent collapse of the flanges. Do not notch the frame flanges to make U-bolt fit. SEE FIGURE C
- U-bolts or attaching hardware should not contact fuel, brake or electrical system components . A shear plate should be utilized if there is insufficient space for a U-bolt to be installed between the frame and fuel tank.
- All threaded fasteners (including U-Bolts) must be either 5/8" Diameter Grade 8, or M16 Property Class 10.9 for metric bolts and M16 Property Class 10 for metric nuts.
- Fastener Torques: 60-65 ft-lb for 5/8" fasteners, 200 +/- 30Nm for M16 fasteners.
- Direct the threaded end of the bolts away from any fuel, brake or electrical system components.
- U-Bolt torque must be checked every six months.
- Note that hard mounting of the SUB to the frame and to the cutaway body may result in noise or vibration issues and/or cutaway body durability issues.

DESIGN INFO / RECOMMENDATION: SECOND UNIT BODY (SUB) MOUNTING GUIDELINES

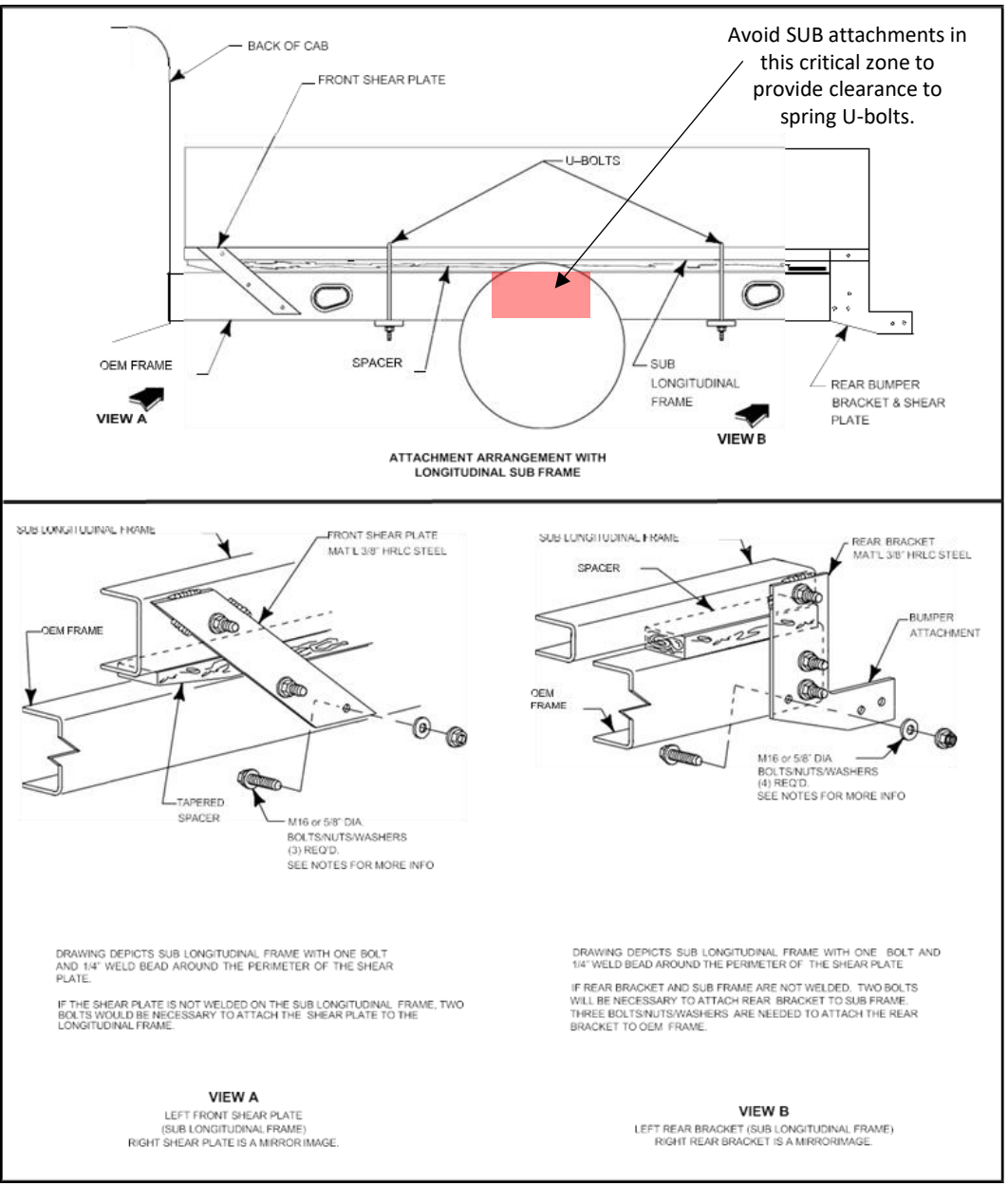

BACK OF CAB
FRONT SHEAR PLATE
U-BOLTS
Avoid SUB attachments in this critical zone to provide clearance to spring U-bolts.
OEM FRAME
SPACER
SUB LONGITUDINAL FRAME
REAR BUMPER BRACKET & SHEAR PLATE
VIEW A
VIEW B
ATTACHMENT ARRANGEMENT WITH LONGITUDINAL SUB FRAME
SUB LONGITUDINAL FRAME
FRONT SHEAR PLATE MAT'L 3/8" HRLC STEEL
OEM FRAME
TAPERED SPACER
M16 or 5/8" DIA. BOLTS/NUTS/WASHERS (3) REQ'D. SEE NOTES FOR MORE INFO
DRAWING DEPICTS SUB LONGITUDINAL FRAME WITH ONE BOLT AND 1/4" WELD BEAD AROUND THE PERIMETER OF THE SHEAR PLATE.
IF THE SHEAR PLATE IS NOT WELDED ON THE SUB LONGITUDINAL FRAME, TWO BOLTS WOULD BE NECESSARY TO ATTACH THE SHEAR PLATE TO THE LONGITUDINAL FRAME.
VIEW A
LEFT FRONT SHEAR PLATE (SUB LONGITUDINAL FRAME) RIGHT SHEAR PLATE IS A MIRROR IMAGE.
SUB LONGITUDINAL FRAME
REAR BRACKET MAT'L 3/8" HRLC STEEL
SPACER
BUMPER ATTACHMENT
OEM FRAME
M16 or 5/8" DIA. BOLTS/NUTS/WASHERS (4) REQ'D. SEE NOTES FOR MORE INFO
DRAWING DEPICTS SUB LONGITUDINAL FRAME WITH ONE BOLT AND 1/4" WELD BEAD AROUND THE PERIMETER OF THE SHEAR PLATE.
IF REAR BRACKET AND SUB FRAME ARE NOT WELDED, TWO BOLTS WILL BE NECESSARY TO ATTACH REAR BRACKET TO SUB FRAME. THREE BOLTS/NUTS/WASHERS ARE NEEDED TO ATTACH THE REAR BRACKET TO OEM FRAME.
VIEW B
LEFT REAR BRACKET (SUB LONGITUDINAL FRAME) RIGHT REAR BRACKET IS A MIRRORIMAGE.

FIGURE A - TECHNIQUE #1
Shear Plates w/Longitudinal SUB Structure

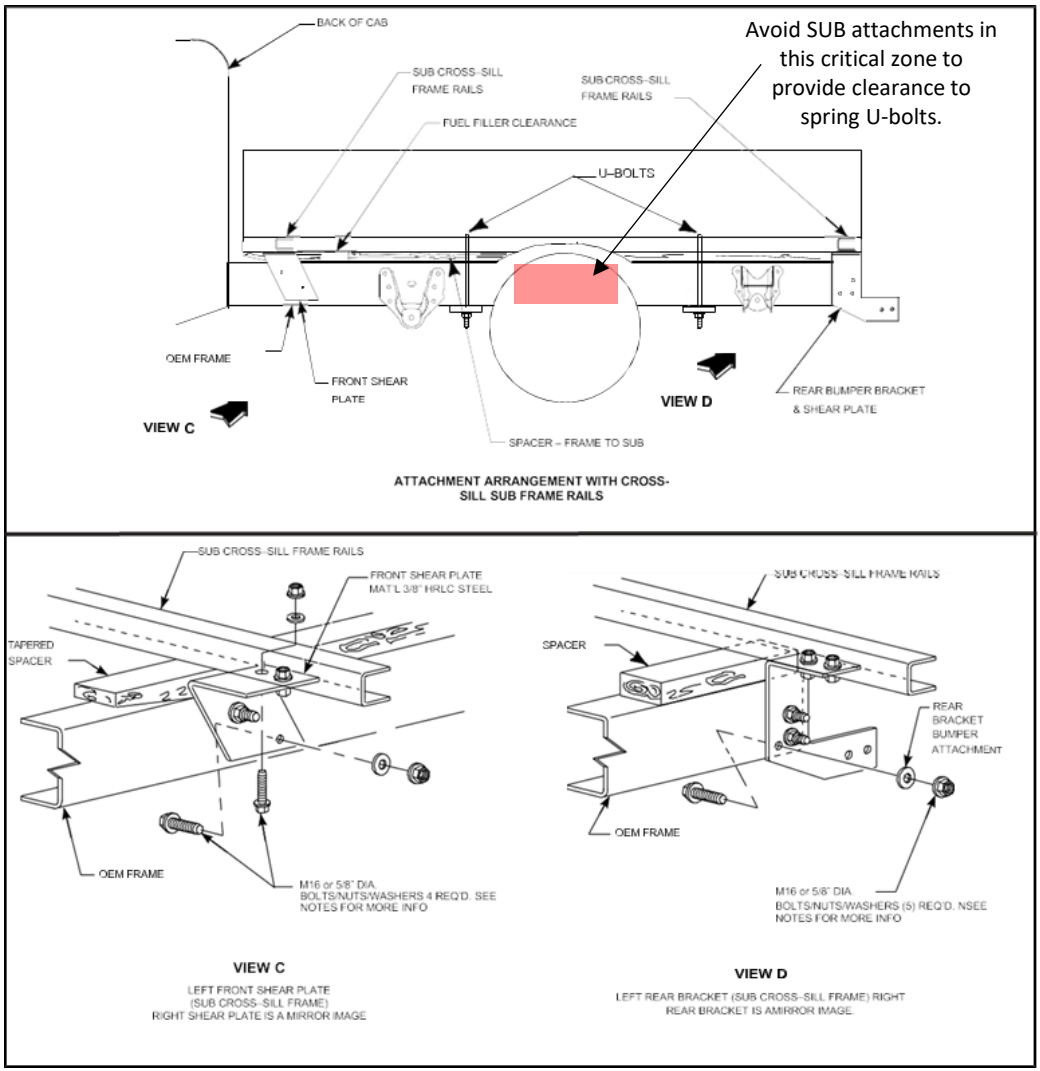
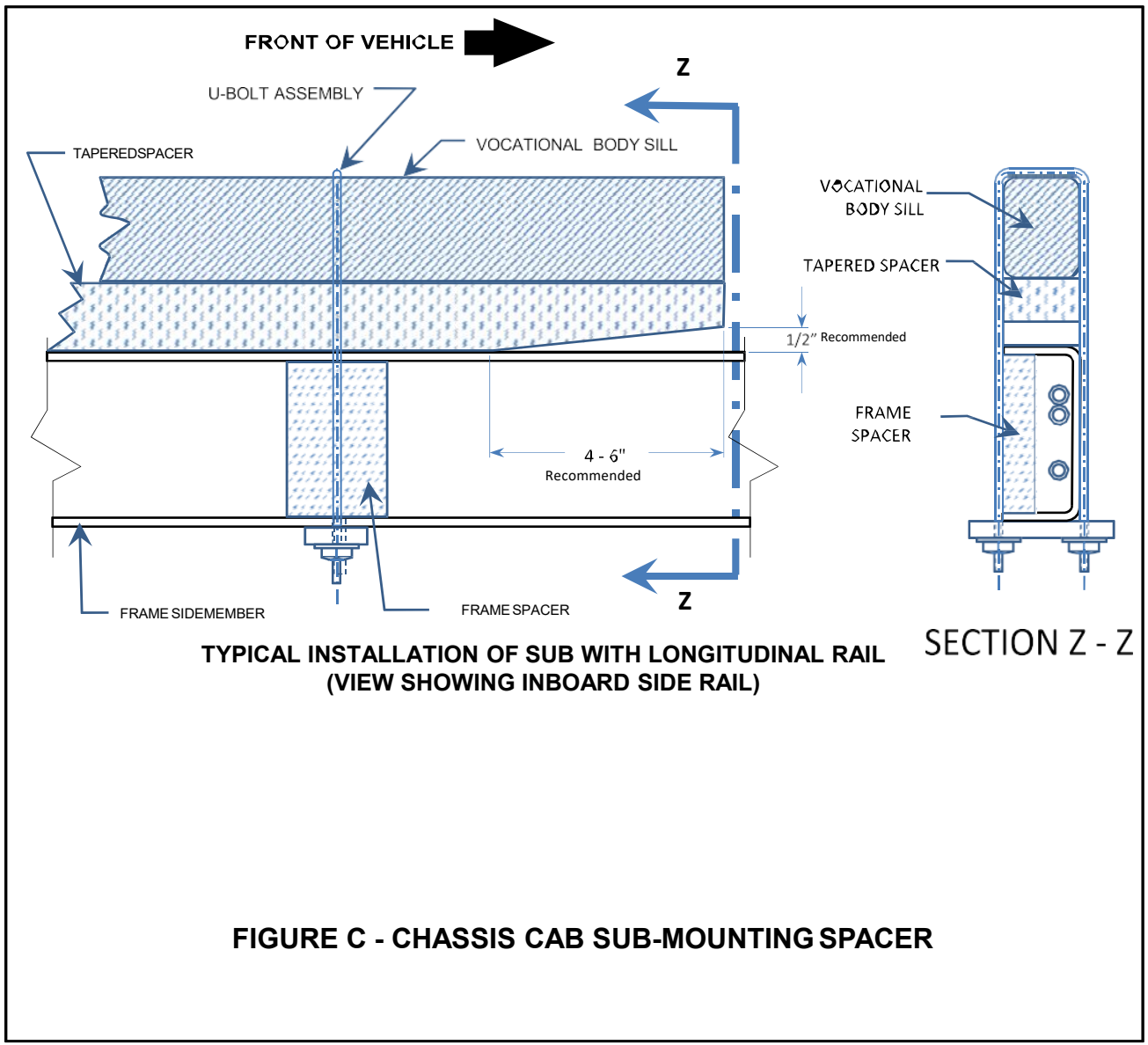

BACK OF CAB
SUB CROSS-SILL FRAME RAILS
SUB CROSS-SILL FRAME RAILS
FUEL FILLER CLEARANCE
U-BOLTS
Avoid SUB attachments in this critical zone to provide clearance to spring U-bolts.
OEM FRAME
FRONT SHEAR PLATE
SPACER – FRAME TO SUB
REAR BUMPER BRACKET & SHEAR PLATE
VIEW C
VIEW D
ATTACHMENT ARRANGEMENT WITH CROSS-SILL SUB FRAME RAILS
SUB CROSS-SILL FRAME RAILS
FRONT SHEAR PLATE MAT'L 3/8" HRLC STEEL
TAPERED SPACER
OEM FRAME
M16 or 5/8" DIA. BOLTS/NUTS/WASHERS 4 REQ'D. SEE NOTES FOR MORE INFO
VIEW C
LEFT FRONT SHEAR PLATE (SUB CROSS-SILL FRAME) RIGHT SHEAR PLATE IS A MIRROR IMAGE
SUB CROSS-SILL FRAME RAILS
SPACER
REAR BRACKET BUMPER ATTACHMENT
OEM FRAME
M16 or 5/8" DIA. BOLTS/NUTS/WASHERS (5) REQ'D. NSEE NOTES FOR MORE INFO
VIEW D
LEFT REAR BRACKET (SUB CROSS-SILL FRAME) RIGHT REAR BRACKET IS AMIRROR IMAGE.

FIGURE B - TECHNIQUE #2
Shear Plates w/Lateral SUB Structure

DESIGN INFO / RECOMMENDATION: SECOND UNIT BODY (SUB) MOUNTING GUIDELINES

Where wrap-around body attachments (such as U-Bolts) are used, the frame side members must have flange reinforcement spacers to avoid flange damage when full torque is applied to the attaching bolts. Spacers are recommended and must be cut out to clear brake-lines, fuel lines, wiring, etc.

If metal spacers are used, no welding to the frame side members is permitted. Tapered spacers between the vocational-body sill and the frame side members flanges are recommended. Recommended taper is ½-inch at the frontend, diminishing to the contact 4 to 6 inches rearward. (See sketch for typical installations)



TYPICAL INSTALLATION OF SUB WITH LONGITUDINAL RAIL
(VIEW SHOWING INBOARD SIDE RAIL)

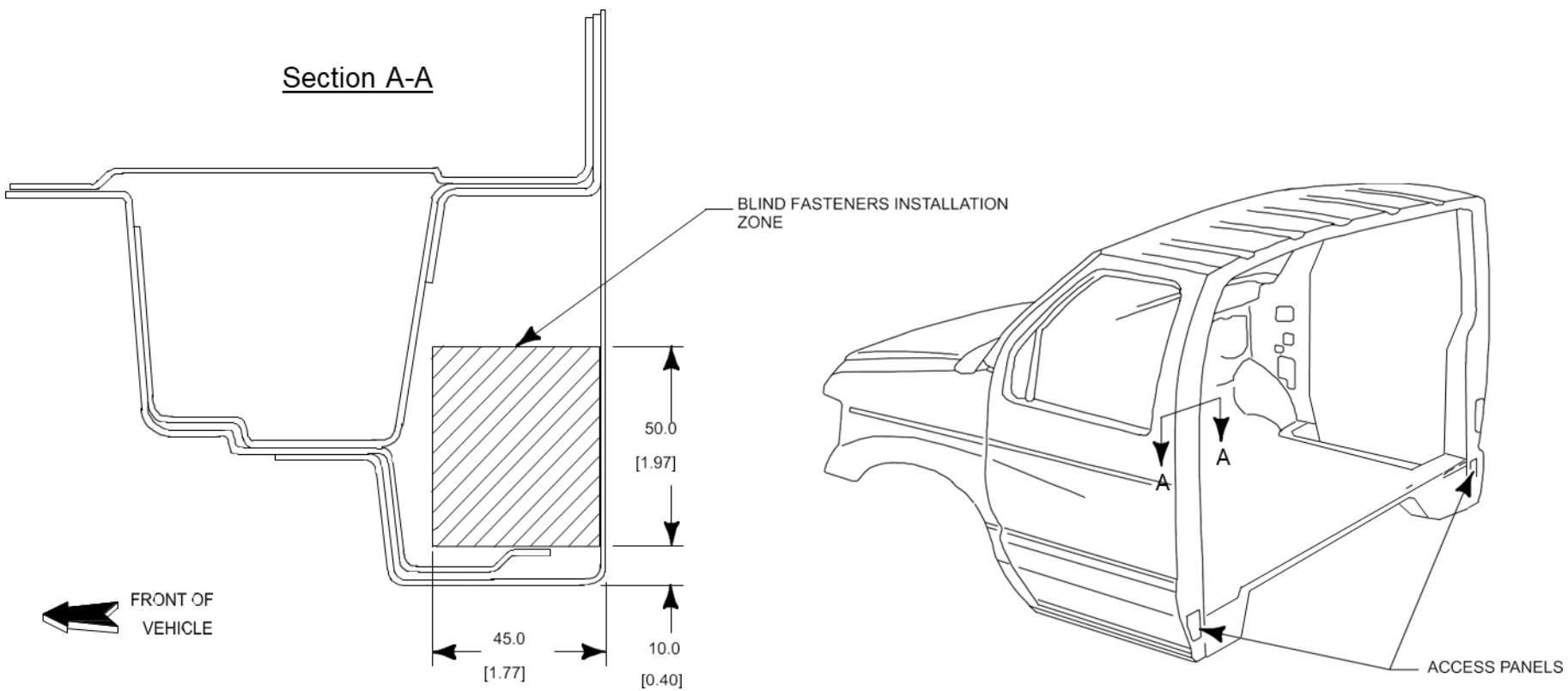
FIGURE C - CHASSIS CAB SUB-MOUNTING SPACER

DESIGN INFO / RECOMMENDATION: SECOND UNIT BODY (SUB) MOUNTING GUIDELINES

SUB TO CAB ATTACHMENT TECHNIQUES FOR CUTAWAY MODEL

The attachment of the SUB to the cutaway body should consider the following:

- Blind installation of self-expanding nut type fasteners can be located in the zone as defined in the figure on this page, and should allow for functional expansion, and be equally spaced. The body edge flange may also be used for fasteners provided the center of the required hole is 1.5 times the hole diameter from the edge of the panel. These recommendations apply to both B-pillar attachment.
- Removal of the access panel and fasteners at the lower area of the B-pillar will allow for flush mounting of the SUB. This opening should be completely covered and sealed from obvious climatic conditions.
- Roof attachments should be equally spaced and are permitted on the flange provided. The center of the required holes should be 1.5 times the hole diameter from the edge of the flange.
- Floor attachments should be equally spaced and are permitted on the flange provided. The center of the required holes should be 1.5 times the hole diameter from the edge of the panel.
- Washers or doublers should be considered to increase the bearing surface under fasteners to increase joint integrity and to decrease sheet metal fatigue, squeaks, and rattles. Gaskets or sealers installed between the cutaway body and the SUB should consider the displacement and stabilization of such materials when calmed, and the effect on joint integrity.

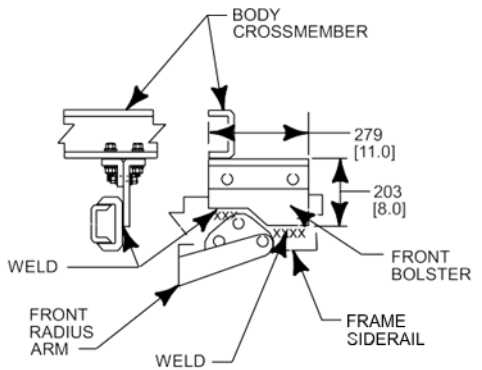


E-SERIES CUTAWAY BODY TO SECOND UNIT BODY ATTACHMENT

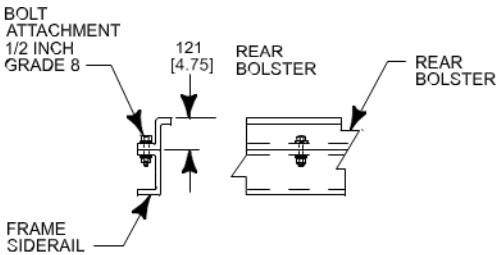
DESIGN INFO / RECOMMENDATION: SECOND UNIT BODY (SUB) MOUNTING GUIDELINES – STRIPPED CHASSIS

SUB TO FRAME MOUNTING TECHNIQUES FOR STRIPPED CHASSIS

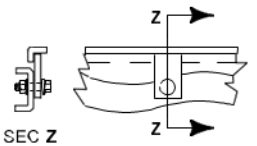
- A full-length structural body should be attached to the chassis utilizing a system of body bolsters bolted and welded to the chassis frame side member as shown.
- Rear body bolsters extend along the parallel sections of the frame side member using the existing 34.8 mm [1.37 in.] diameter holes as shown in **VIEW B**.
- Bolster attachment in the rear axle kick-up area can be accomplished by bolting shear plates to the web of the frame side member as shown in **VIEW C**.
- Front body bolsters should be attached to the frame side members as far forward as possible. They should be welded to the web of the frame side member immediately to the rear of the front radiator and cowl support structure as shown in **VIEW A**. Front bolsters should not be bolted to the frame side member in this area since there is no access to the inside surface side member.
- Each front bolster should be rigidly connected to the corresponding rear bolster through the body floor or a tie bar.
- Refer to the design recommendations (Frame Section of the GENERAL BBLB, available at Fordpro.com/en-us/upfit/bbas/ under Publications) for guidelines regarding drilling and welding the vehicle frame.



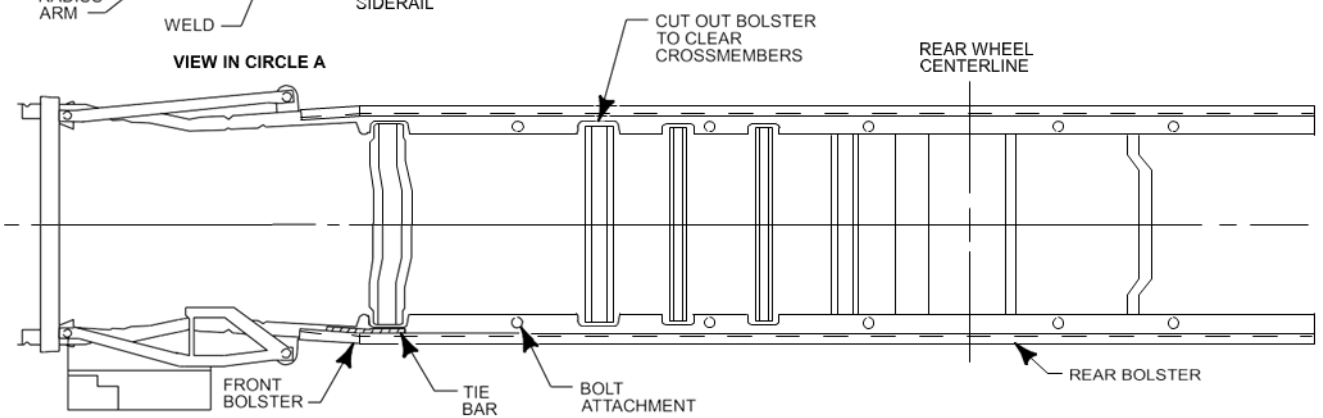
VIEW IN CIRCLE A

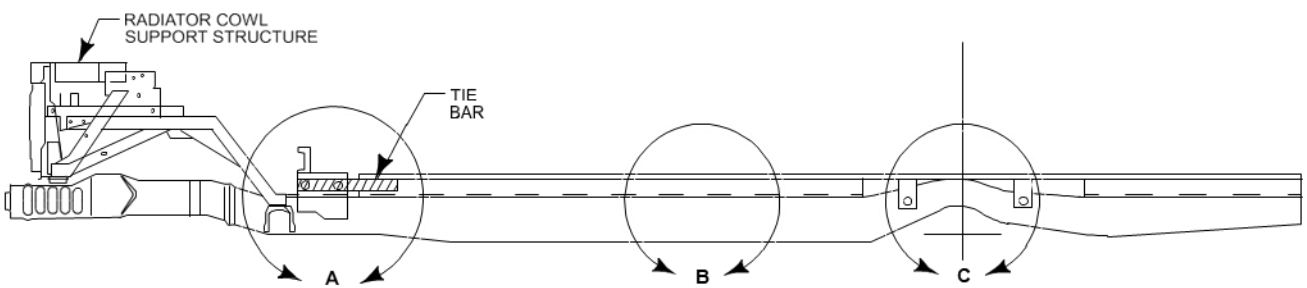


VIEW IN CIRCLE B



VIEW IN CIRCLE C

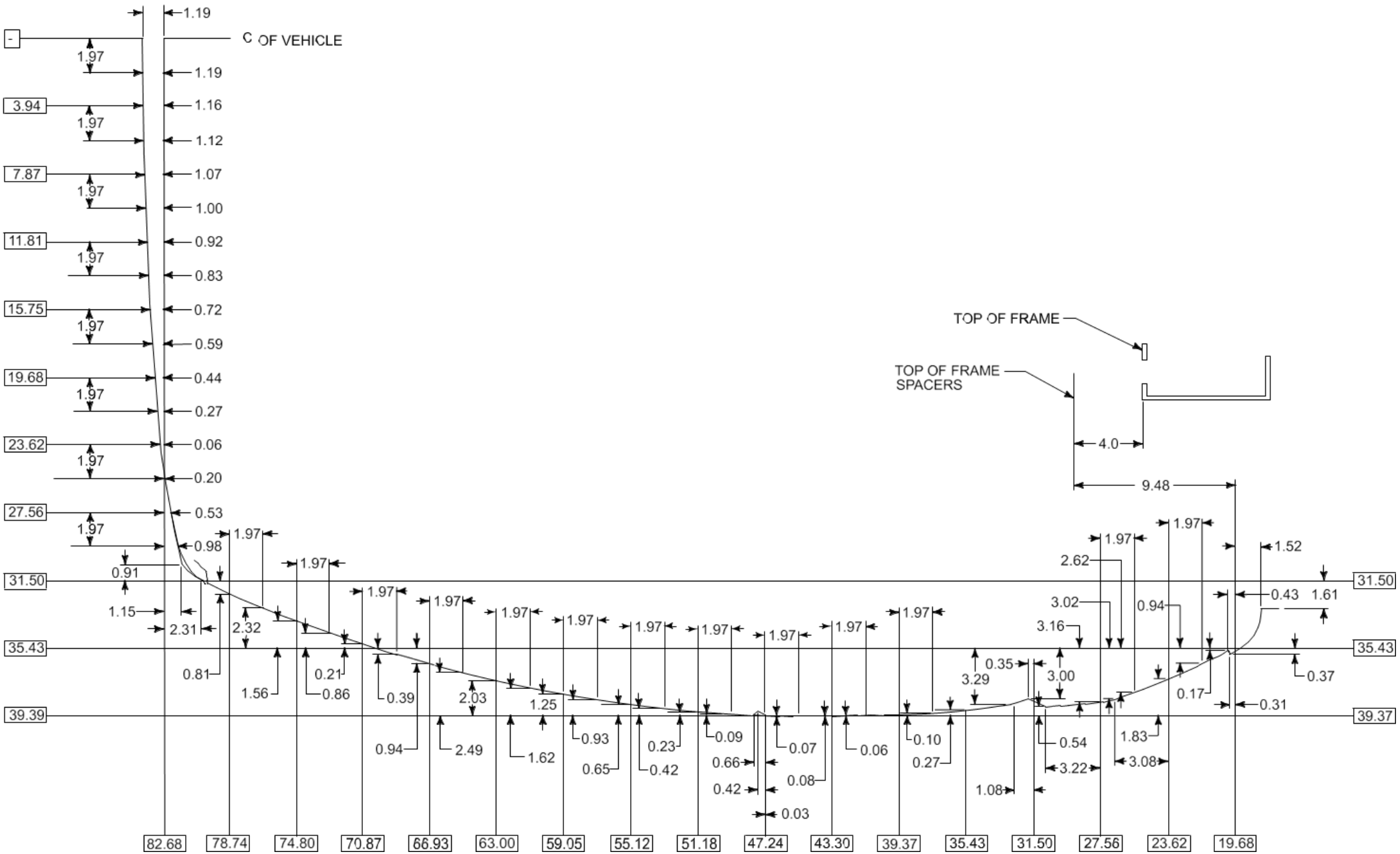




NOTE: Dimensions are suggested and may be revised at the Body Builder's discretion

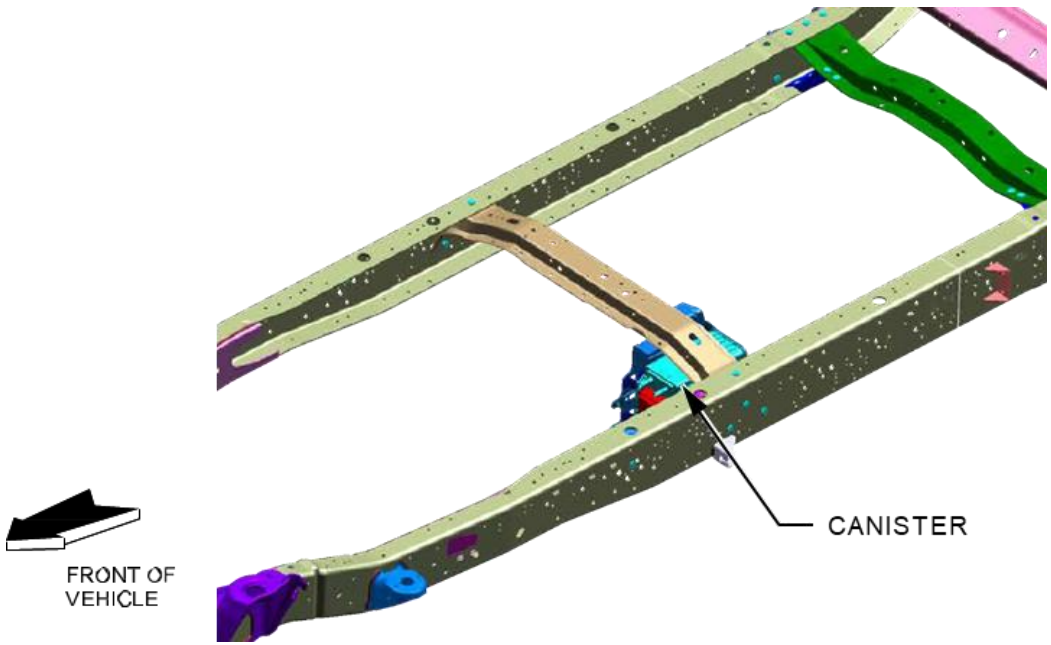
E-SERIES STRIPPED CHASSIS SECOND UNIT BODY INSTALLATION

DESIGN INFO / RECOMMENDATION: BACK OF CAB PROFILE DIMENSIONS CUTAWAY BODY SECTIONS "A"

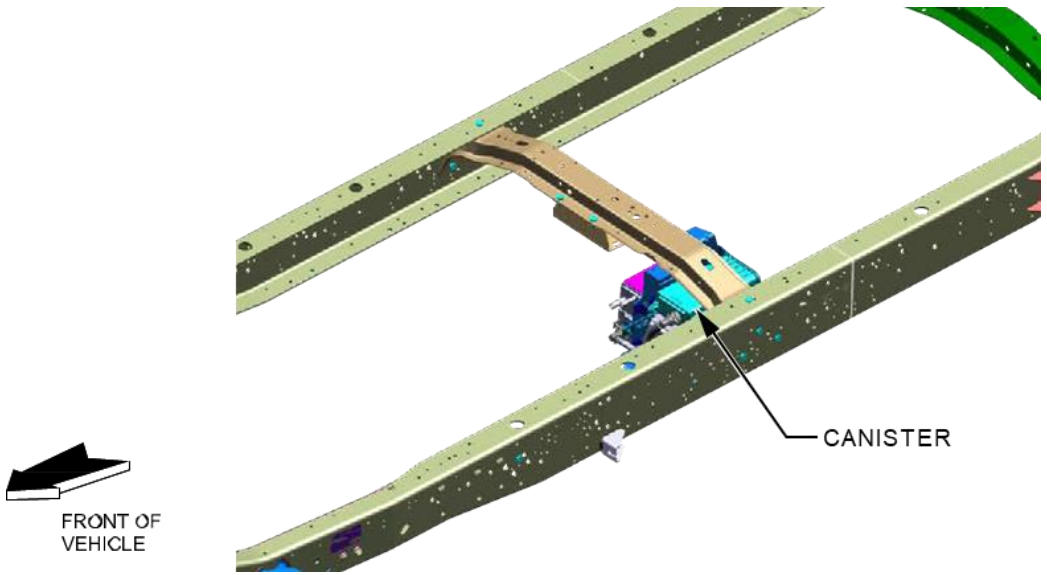


NOTE- [ ] DIMENSION ARE INCHES

DESIGN INFO / RECOMMENDATION: AFT-OF-AXLE FUEL TANK EVAP. EMISSIONS CANISTER LOCATION - CUTAWAY



SINGLE CANISTER VARIANT THAT GOES ON VEHICLES WITH THE 40-GAL FUEL TANK



DUAL CANISTER VARIANT THAT GOES ON VEHICLES WITH THE 55-GAL FUEL TANK

CLIMATE CONTROL: GHG EVAPORATIVE EMISSIONS

GREEN HOUSE GAS (GHG) EVAPORATIVE EMMISSIONS

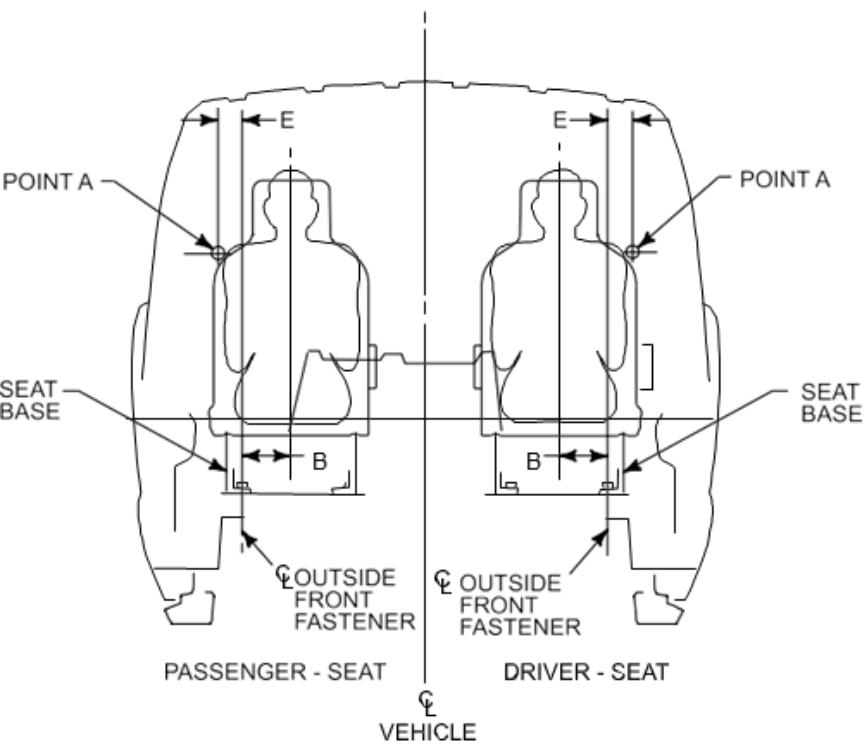
Pursuant to California regulation 17 CCR §95663 and EPA 40CFR 1037.115(e), the specific leakage for this vehicle (as built by Ford Motor Company) is shown in the table below (see "J2727 Leakage Value" column). If the vehicle air conditioning system is modified in any way, or air conditioning systems are added, the intermediate or final-stage manufacturer must calculate the final system leakage.

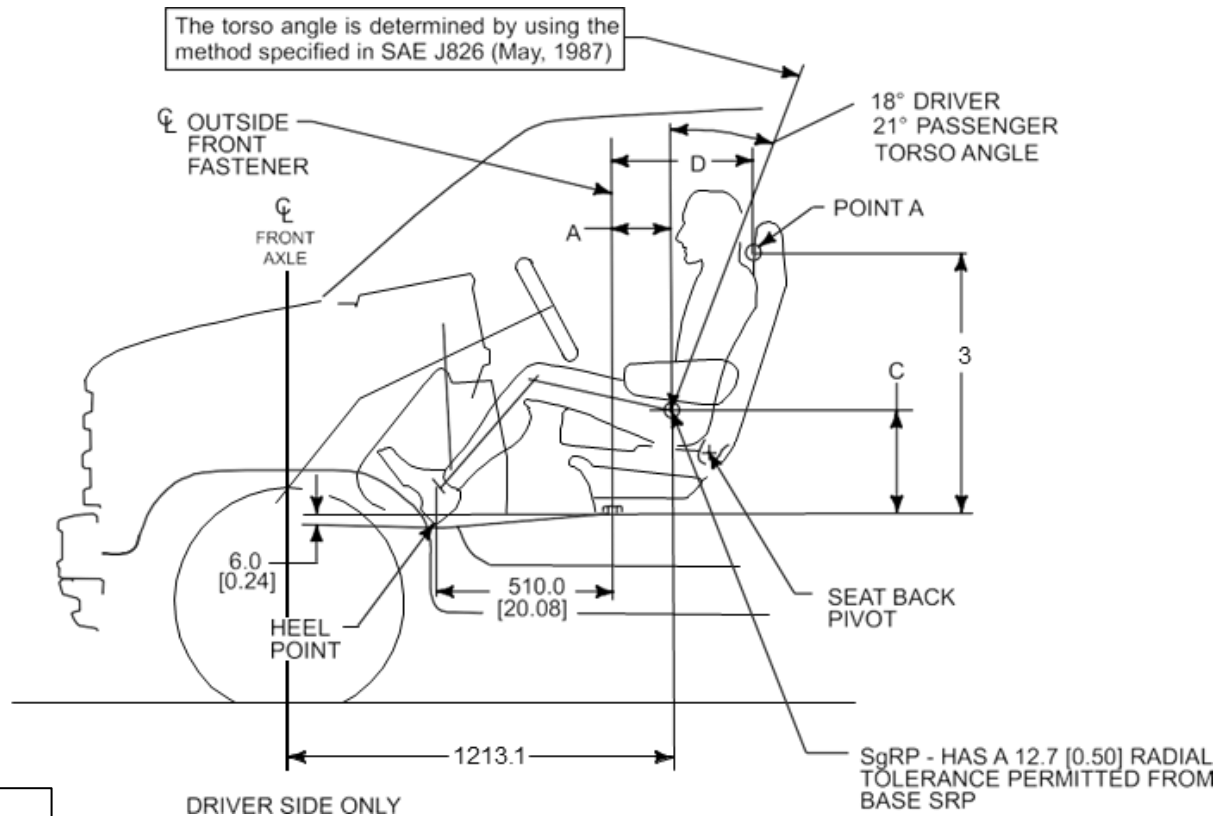
The Ford A/C Prep Package on the stripped chassis vehicle, if equipped, is an incomplete air conditioning system which must be completed to meet the leakage requirements as outlined in the Delegated Assembly Agreement. The intermediate or final-stage manufacturer must calculate the final system leakage. In order to maintain vehicle compliance with a completed Ford air conditioning system, Ford will provide the final stage manufacturer's SAE J2727 leakage information and air conditioning schematics to California Air Resources Board (CARB) and EPA.

The spreadsheet used by Ford to calculate the J2727 Leakage is available and can be updated to reflect the modified or completed system. Please contact Ford BBAS to request a copy of the vehicle line specific GHG Evaporative Emissions Worksheet: Fordpro.com/en-us/upfit/bbas/

MY	VEHICLE LINE	FEATURES/MODELS	EVAPORATOR	POWERTRAIN	REFRIGERANT	CHARGE SIZE OF A/C SYSTEM (KG)	J2727 LEAKAGE VALUE (G/YR)	MAX ALLOWED LEAKAGE
2027	VN127	W/ AUX PREP PACK	SINGLE	7.3 L V8 Gas	R-134a	1.531	10.252	22.965
2027	VN127	W/O AUX PREP PACK	SINGLE	7.3 L V8 Gas	R-134a	0.850	9.413	12.750
2027	VN127	STRIPPED CHASSIS	N/A	7.3 L V8 Gas	R-134a	0.000	6.917	11.000

DESIGN INFO / RECOMMENDATION: SEAT POSITION E-350/450 CUTAWAY





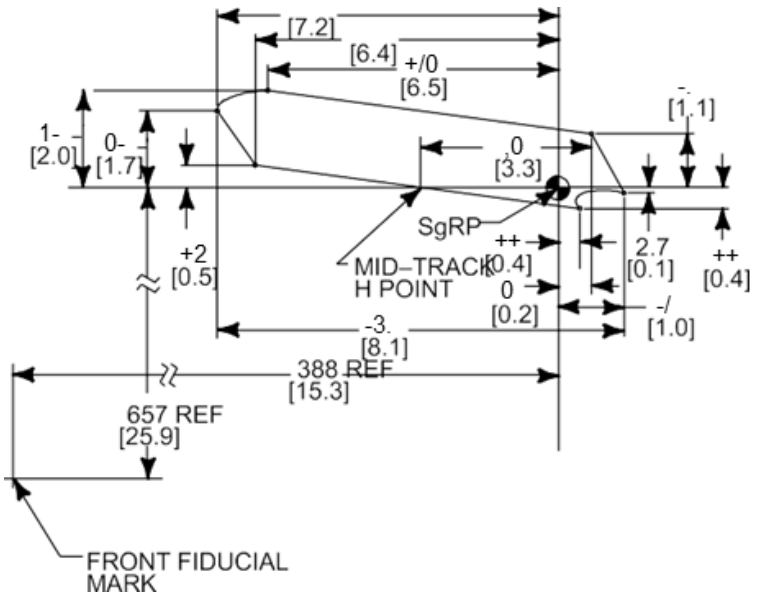
IMPORTANT:
The dimensions in this figure require the vehicle to be at Design Position. The E-SERIES vehicles at Design Position will be level from front to rear, and side-to-side, on the upper surface of the ribbed floor panel from the B-Pillar rearward.

SRP INFOMRATION (SEAT POSITION IS 10mm [0.30 in.] FORWARD OF REAR MOST POSITION)				POINT A (SEAT POSITION IS AT THE MIDPOINT OF AVAILABLE TRAVEL)		
SEAT	A	B	C	D	E	F
DRIVER	217.8 [8.57]	105.0 [4.13]	384.2 [15.13]	356.0 [14.01]	67.0 [2.64]	937.4 [36.90]
PASSENGER	277.3 [10.92]	103.0 [4.06]	377.0 [14.84]	412.0 [16.22]	65.0 [2.56]	960.1 [37.80]

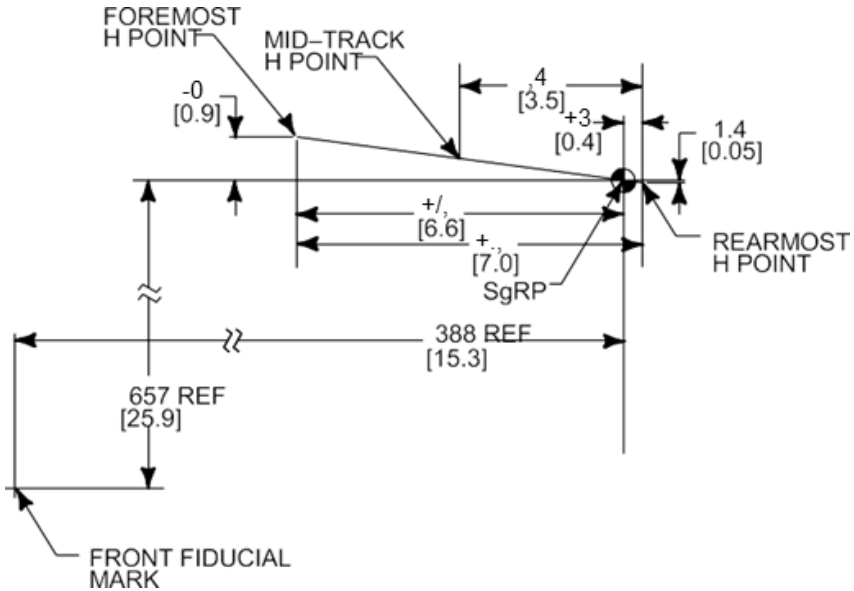
FRONT COMPARTMENT		
CODE	DESCRIPTION	DIMENSION
L34	MAXIMUM EFFECTIVE LEG ROOM – FRONT	1015 [40.0]
W3	SHOULDER ROOM – FRONT	1729 [68.1]
W5	HIP ROOM – FRONT	1667 [65.5]
W117	BODY WIDTH AT H-POINT	1996 [78.6]
H61	EFFECTIVE HEAD ROOM – FRONT	1070 [42.1]

NOTE- [ ] DIMENSION ARE INCHES

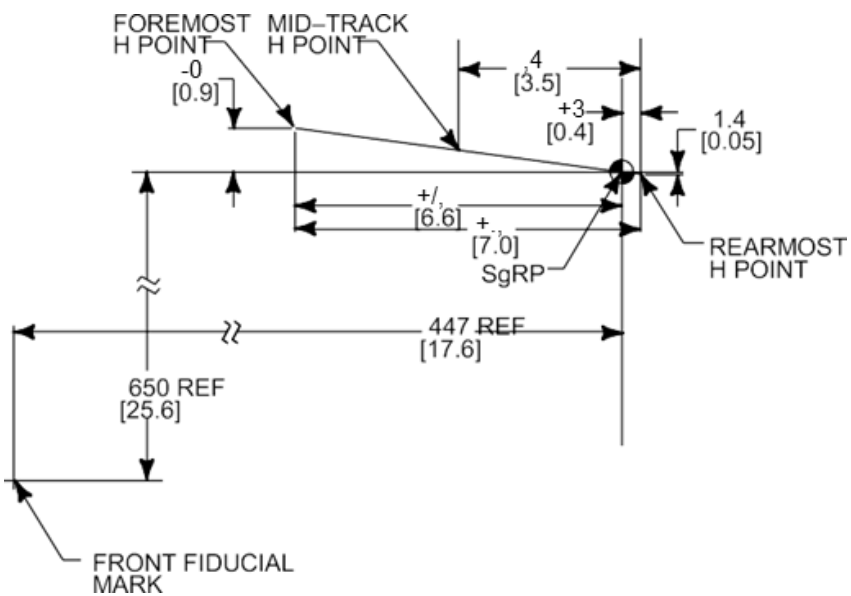
DESIGN INFO / RECOMMENDATION: SEAT TRACK TRAVEL / H-POINT LOCATION



DRIVER POWER TRACK



DRIVER MANUAL TRACK



FRONT PASSENGER MANUAL TRACK

IMPORTANT:
THIS SEAT INFORMATION IS PROVIDED TO ASSIST IN THE INSTALLATION OF SEATS OTHER THAN FORD INSTALLED SEATS AND TO HELP PRESERVE THE INTENDED PERFORMANCE OF THE SAFETY AND ERGONOMIC FEATURES OF THE E-SERIES.

THE MID-TRACK H-POINT LOCATION MUST BE MAINTAINED IN ORDER TO COMPLY WITH F/CMVSS 208 AIRBAG REQUIREMENTS.

GUIDELINES FOR MODIFYING FORD TRUCK WHEELBASES EQUIPPED WITH ELECTRONIC STABILITY CONTROL (ESC)

All E-Series have Electronic Stability Control (ESC) as STANDARD equipment, with an option to delete ESC. **Wheelbase modification of a truck equipped with ESC affects vehicle function, which may result in sub-standard performance of the ESC system and/or ESC, Anti-lock Brake or Traction Control faults/lights unless module calibrations are updated as appropriate for the modified wheelbase.**

Ford supports upfitters that modify wheelbases of affected vehicles with ESC with an app in the Ford Diagnosis and Repair System (FDRS) tool that will update ESC calibrations as needed. See the FDRS Wheelbase Configuration Application section on the next page for details on how to use the app. Subsequent stage manufacturers that do not have an FDRS tool can purchase the software license and check for compatible scan tool hardware here, or contact their local Ford Dealership for assistance.

Modified wheelbase lengths within the ranges provided below are supported by the FDRS Wheelbase Configuration App. Each individual range of wheelbase length provided represents a unique ESC calibration. In most cases, the factory wheelbase and modified wheelbase lengths will be in different ranges and will require use of the FDRS Wheelbase Configuration App to revise the ESC calibration. In cases where the factory wheelbase and modified wheelbase are within the same range, the ESC calibration does not need to be updated.

E-Series:

- E-350 10,050 - 11.5k GVWR Cutaway
  - 138-151”
  - 152-170”
- E-350 11.5k GVWR Stripped Chassis
  - 138-151”
- E-350 12.5k GVWR Cutaway and Stripped Chassis
  - 152-170”
  - 171-183”
  - 184-201”
  - 202-214”
  - 215-232”
- E-450 All GVWR Cutaway and Stripped Chassis
  - 158-170”
  - 171-183”
  - 184-201”
  - 202-214”
  - 215-232”

If a modified wheelbase length outside of the listed ranges is planned, the vehicle should be ordered with the available ESC Delete option as it will not be supported with proper ESC calibrations.

Whether the FDRS tool is used to update the vehicle calibrations or not, it is the responsibility of the final stage manufacturer to evaluate the completed vehicle to ensure vehicle performance is acceptable to the end customer.

NOTES:

- The chassis wheelbase shall not be modified shorter than the shortest factory wheelbase offered for that series or GVWR
- Vehicles with Lane Departure Warning feature: The chassis wheelbase should not be shortened more than 16 inches from the original wheelbase as the feature performance will be negatively affected.
- Vehicles with Tire Pressure Monitor System (TPMS) feature: Increasing the distance between the TPMS receiver module and either front or rear axle beyond the largest spacing provided by Ford may negatively affect feature performance. The final stage manufacturer is responsible for evaluating TPMS system performance on the completed vehicle.
- Statements of Conformity in the vehicle Incomplete Vehicle Manual may have conditions that are affected by the vehicle wheelbase. Please review the IVM and use the modified wheelbase value to complete assessments where appropriate.
- The General Body Builder Layout Book contains much information regarding wheelbase modifications. A search for the term “wheelbase” within the General BBLB will reveal related content, see the following sections under “Design Recommendations” at a minimum:
  - Fuel System
  - Electrical – sections regarding “Electrical Wiring”
  - Brake System
  - Frame – sections on wheelbase modifications for light and medium vehicles

GUIDELINES FOR MODIFYING FORD TRUCK WHEELBASES EQUIPPED WITH ELECTRONIC STABILITY CONTROL (ESC) - CONT

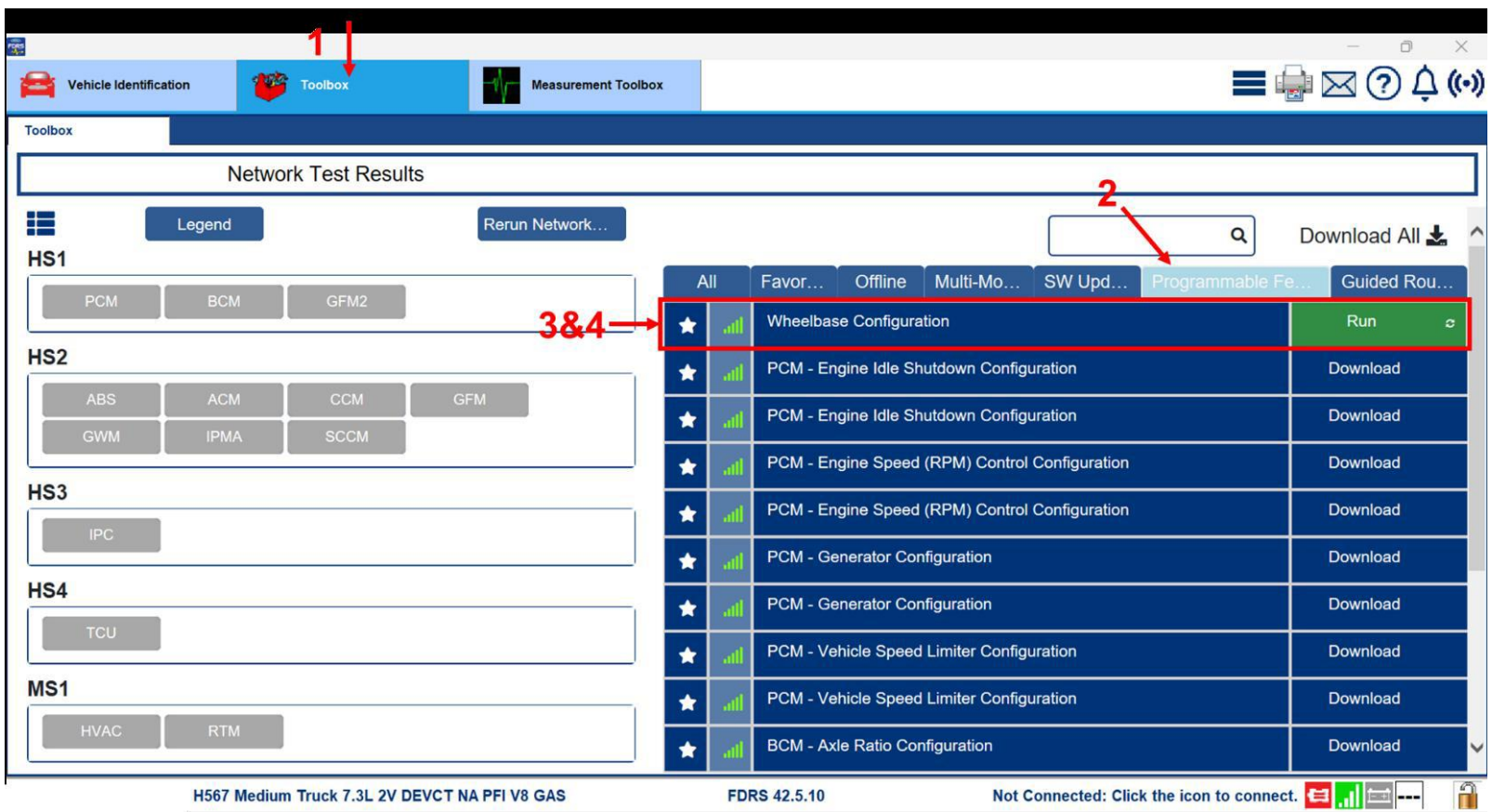
FDRS Wheelbase Configuration Application

This application will be used to update the ABS software and load the correct ESC calibration for the modified vehicle wheelbase.

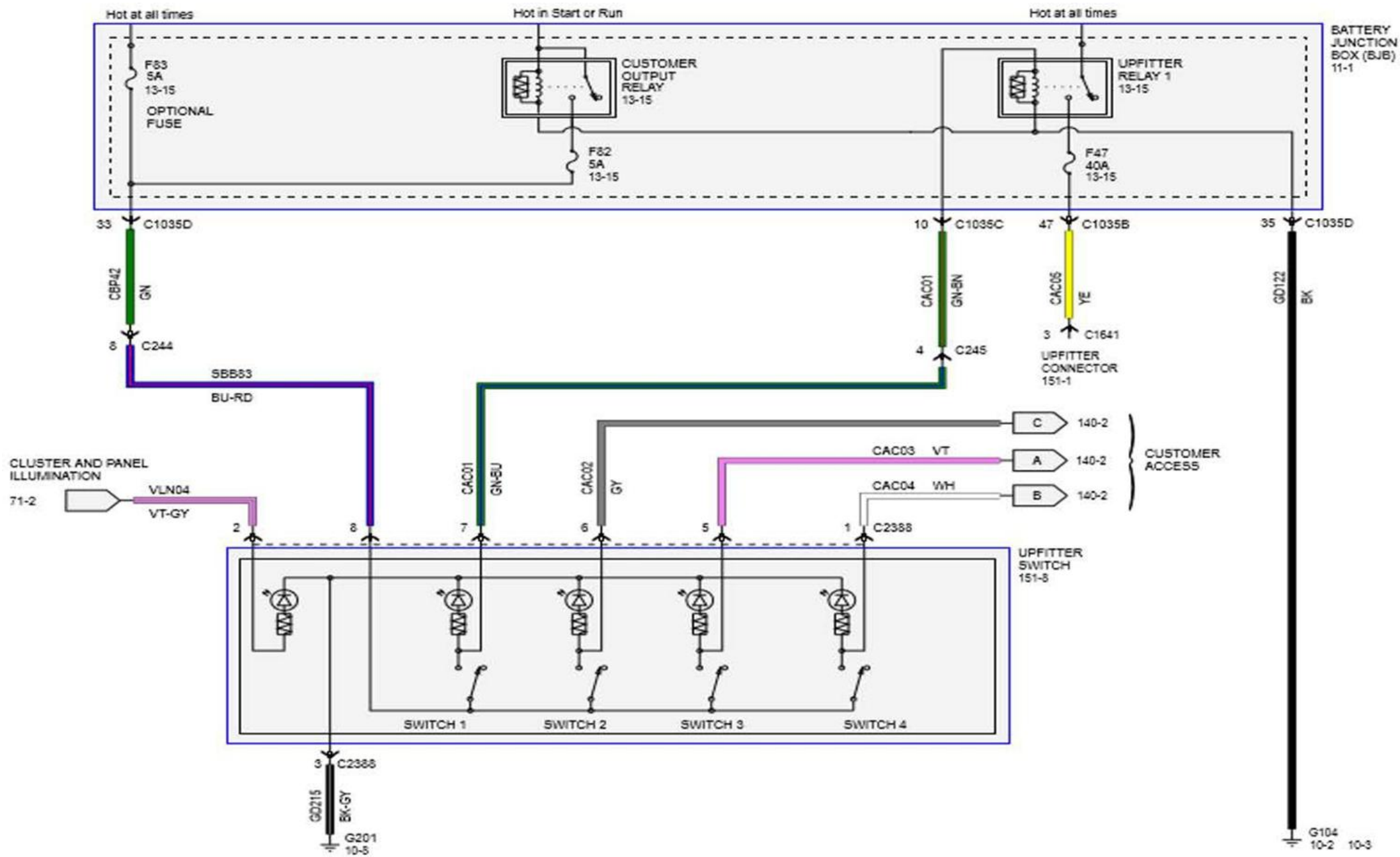
Open the Ford FDRS tool and connect to the vehicle being modified, then:

1. Select “Toolbox”
2. Select “Programmable Features”
3. Download the latest version of “Wheelbase Configuration”
4. Run “Wheelbase Configuration”
5. Password: “M43WBSTRETCH” (all caps)
6. When prompted, you will need to select the range the modified wheelbase falls into (all values in Inches)

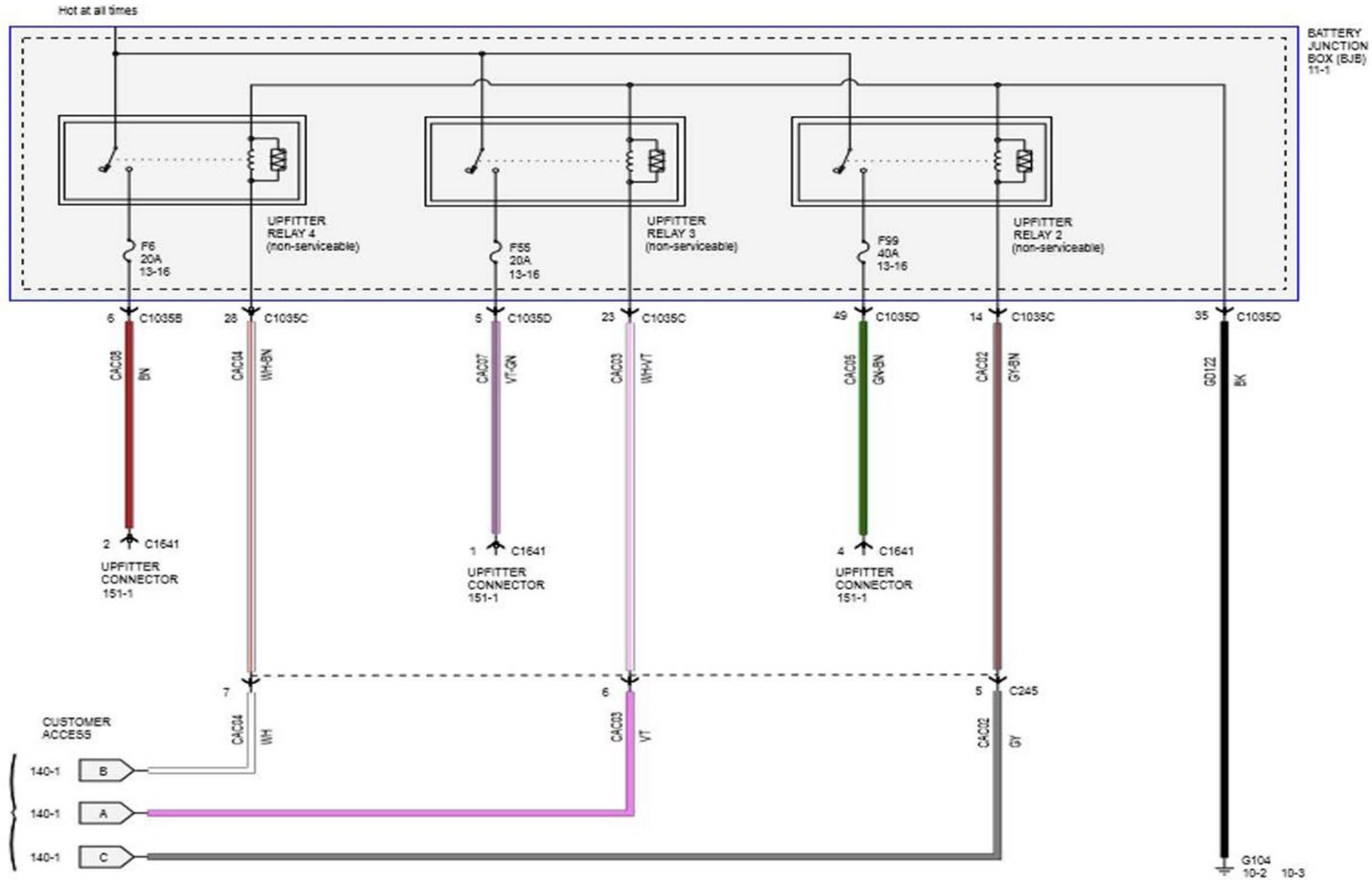
Screen Captures from the FDRS tool are provided below to help visualize the selections.



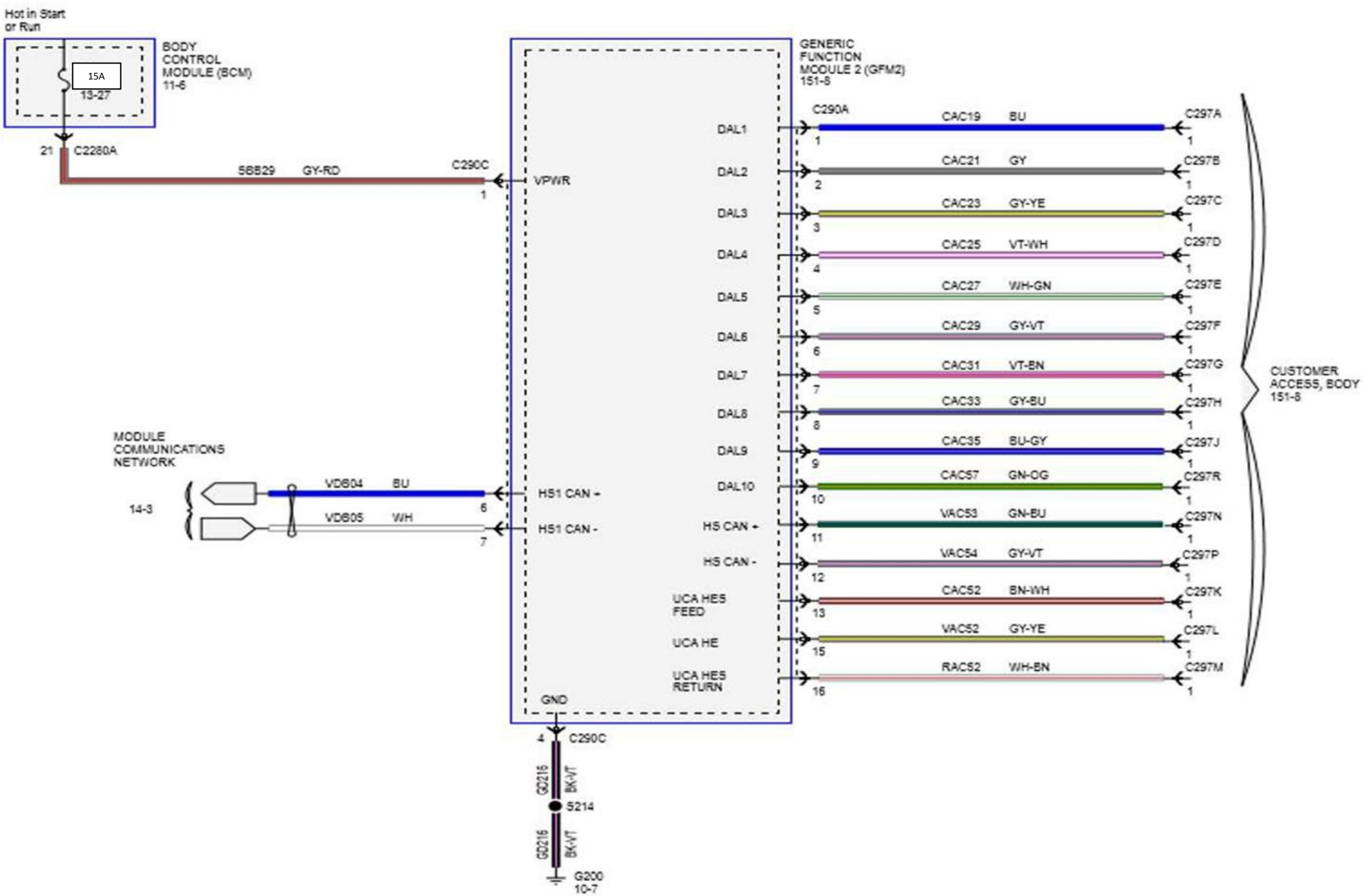
ELECTRICAL: CUSTOMER ACCESS CIRCUITS – UPFITTER SWITCHES



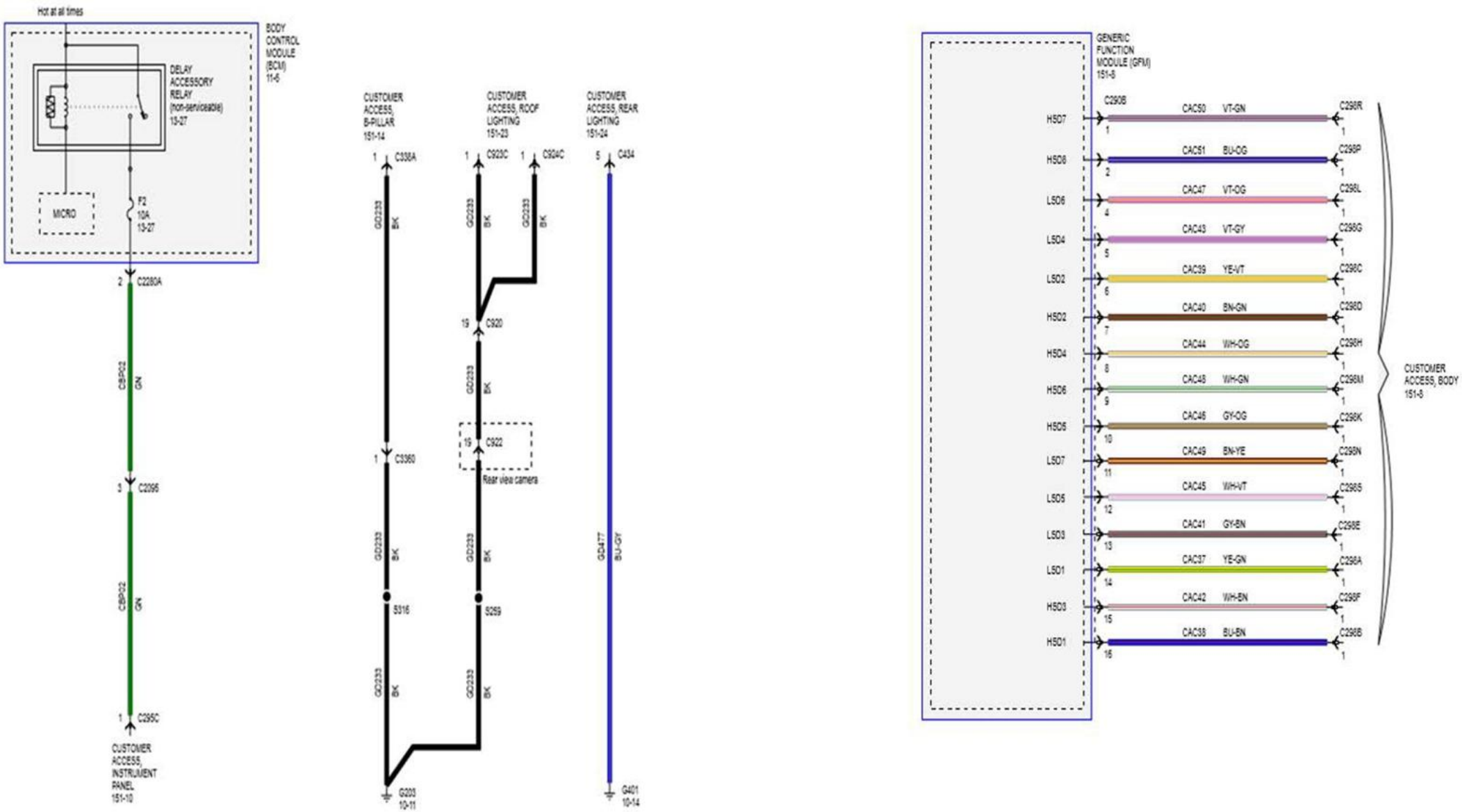
ELECTRICAL: CUSTOMER ACCESS CIRCUITS – BATTERY JUNCTION BOX



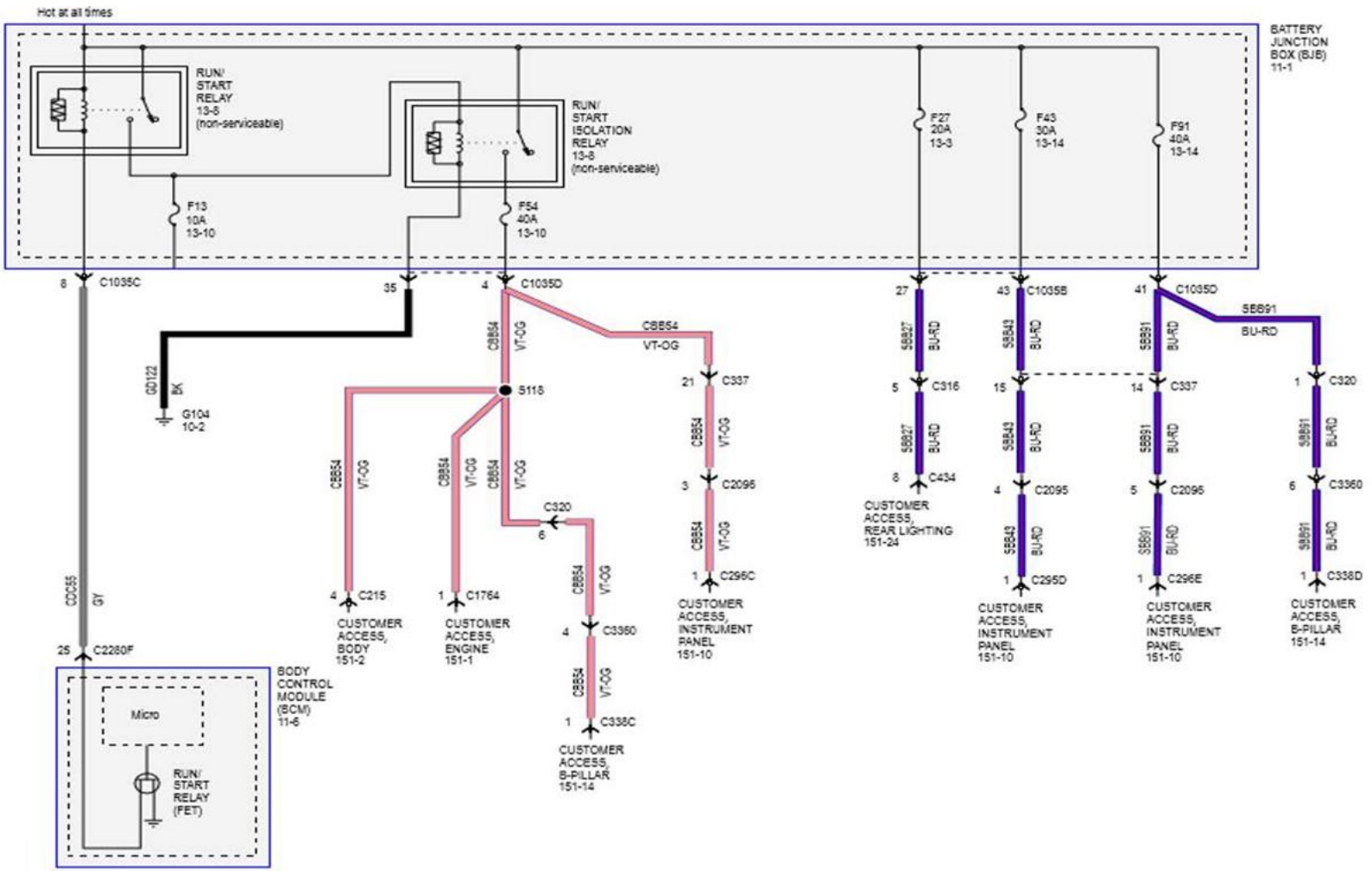
ELECTRICAL: CUSTOMER ACCESS CIRCUITS – VEHICLE INTEGRATION MODULE



ELECTRICAL: CUSTOMER ACCESS CIRCUITS – VEHICLE INTEGRATION MODULE

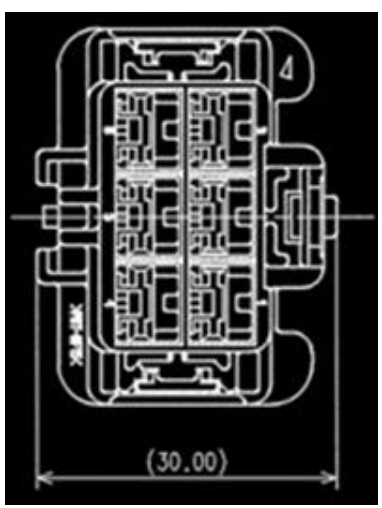


ELECTRICAL: CUSTOMER ACCESS CIRCUITS – B-PILLAR

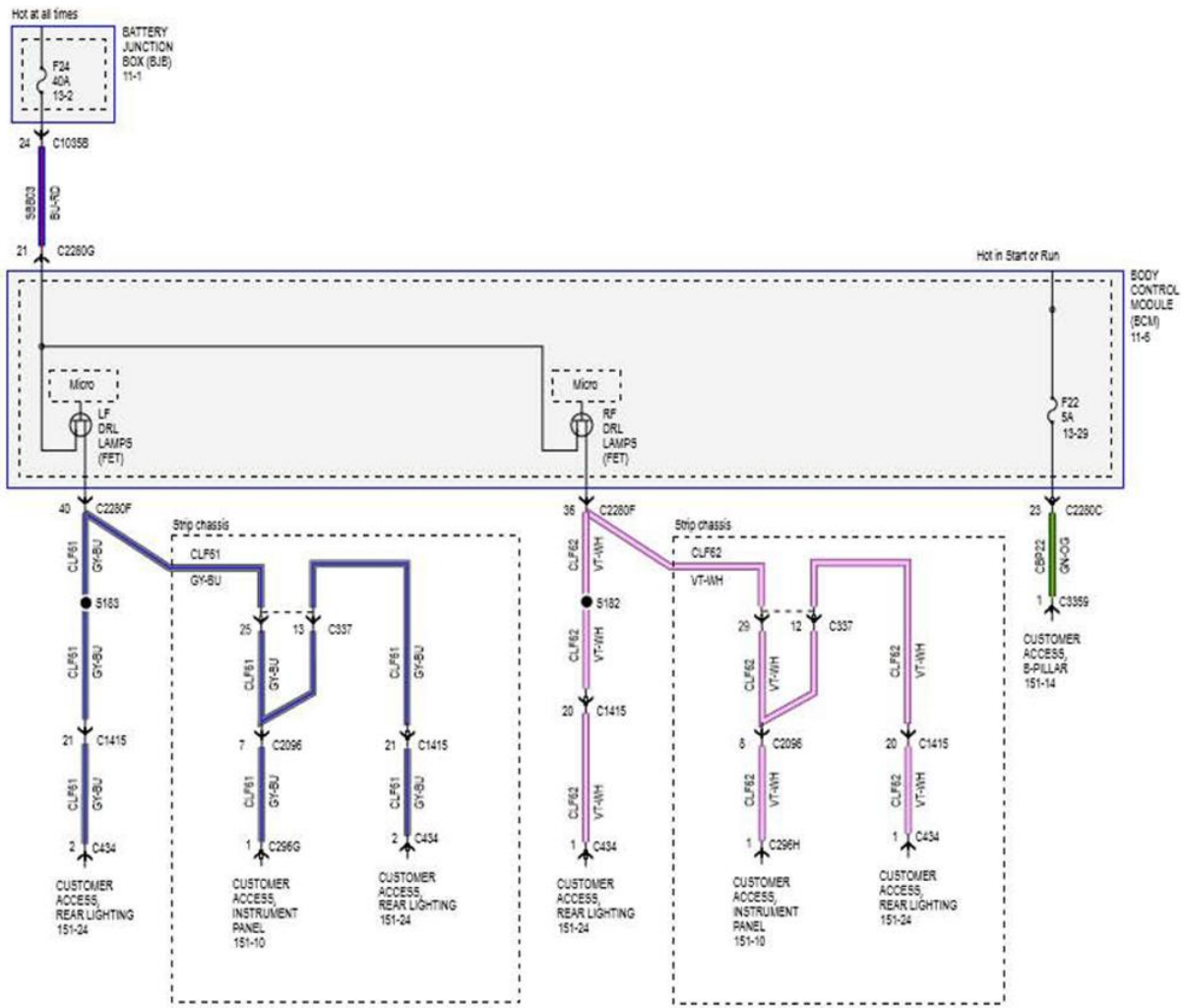


C338X 14A005 – CUSTOMER ACCESS, B=PILLAR (PART# N/A)							
PIN	**CIRCUIT**	**CIRCUIT FUNCTION**	**GAUGE mm**	**GUAGE (AWG)**	**FUSE #**	**FUSE RATING**	**MAX. CONTINUOUS LOAD**
1	GD233	GND NEAR BOTTOM OF A-PILLAR	5	5	N/A	N/A	COMBINED LOAD <45A
3	SBB97	FUSE – 97 OR CIRCUIT BREAKER	5	5	F97, PAAT	50A	40
4	CBB54	FUSE – 54 OR CIRCUIT BREAKER	3	6	F54, R/S	40A	32
6	SBB91	FUSE – 91 OR CIRCUIT BREAKER	3	6	F91, PAAT	40A	32

NOTE: if utilizing pin 1 ground, the combination of loads on pin 3 (F97),4 (F54),and 6 (F91) must be below 45A.

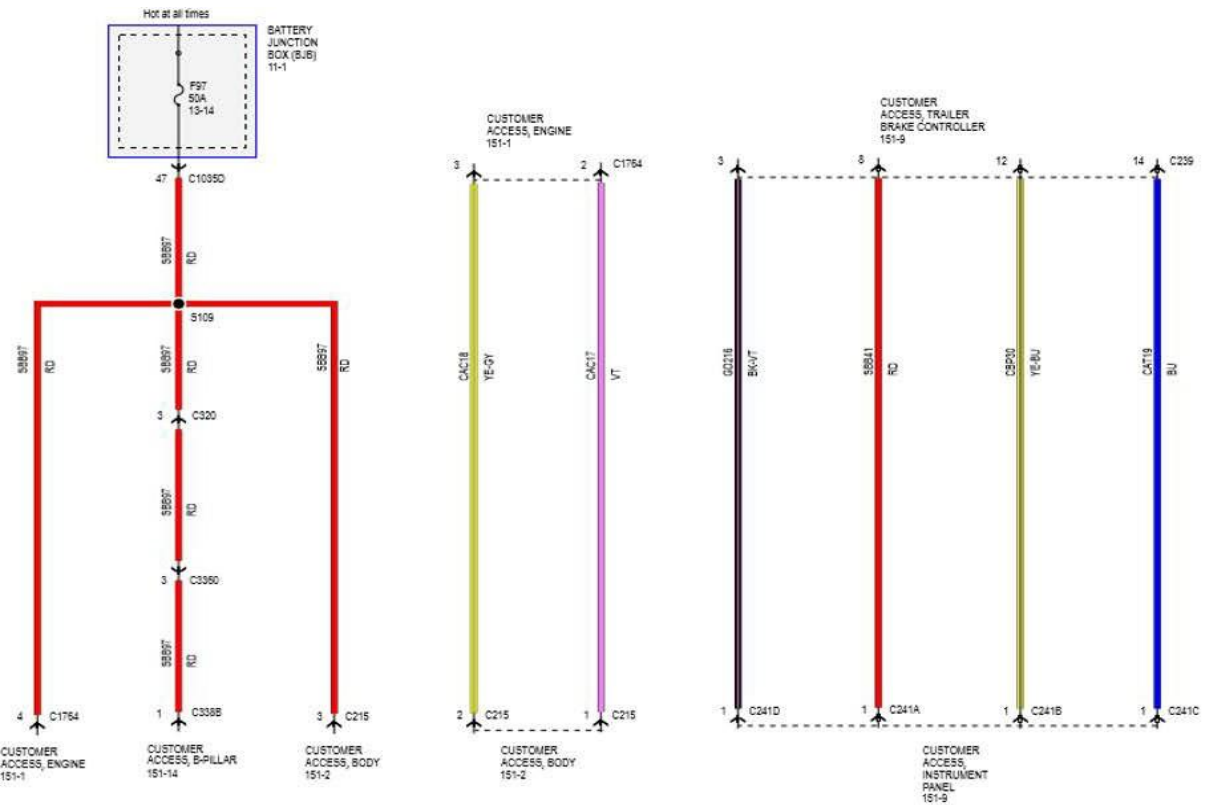


ELECTRICAL: CUSTOMER ACCESS CIRCUITS – B-PILLAR

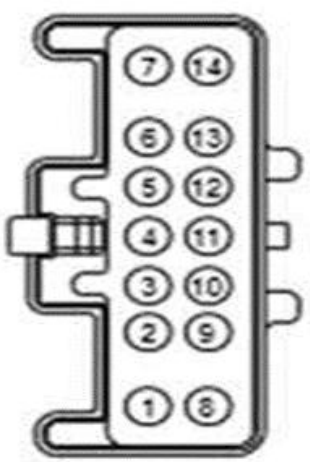


C3359 14A005 – CUSTOMER ACCESS, B=PILLAR (PART# N/A)				
PIN	**CIRCUIT**	**GUAGE (AWG)**	**CIRCUIT FUNCTION**	**QUALIFIER**
1	CBO22 (GN-OG)	20	FUSE – 22 OR CIRCUIT BREAKER	
2	VME12 (BN-WH)	18	CTRL MOD. – AUDIO # SPEAKER RIGHT REAR (WOOFER) +	
3	RME12 (BN-BU)	18	CTRL MOD. – AUDIO # SPEAKER RIGHT REAR (WOOFER) -	
4	VLN33 (GY-VT)	20	CTRL MOD. – INTERIOR/COURTESY LAMP DIMMING (THEATRE)	
5	CPL36 (GN)	20	SWITCH – LATCH REAR DRIVERSIDE # AJAR (INCL. SLIDING DOOR)	
6	CL18 (GY-YE)	20	BATT. SAVE/DEMAND LP	
7	-	-	NOT USED	
8	RME09 (BN-YE)	18	CTRL MOD. – AUDIO # SPEAKER LEFT REAR (WOOFER) -	
9	VME09 (WH-GN)	18	CTRL MOD. – AUDIO # SPEAKER LEFT REAR (WOOFER) +	
10	CBB56 (BU-GN)	16	FUSE – 56 OR CIRCUIT BREAKER	
11	-	-	NOT USED	
12	CPL13 (GY-BN)	18	CTRL MOD. – DOOR LOCK # ALL UNLOCK	
13	COL11 (GY-BN)	18	CTRL MOD. – DOOR LOCK # ALL LOCK	
14	-	-	NOT USED	
15	CLS23 (GY-OG)	20	CTRL. MOD. – TURN LAMP LEFT REAR	
16	CLS27 (GN-OG)	20	CTRL MOD. – TURN LAMP RIGHT	
17	-	-	NOT USED	
18	-	-	NOT USED	
19	-	-	NOT USED	
20	-	-	NOT USED	

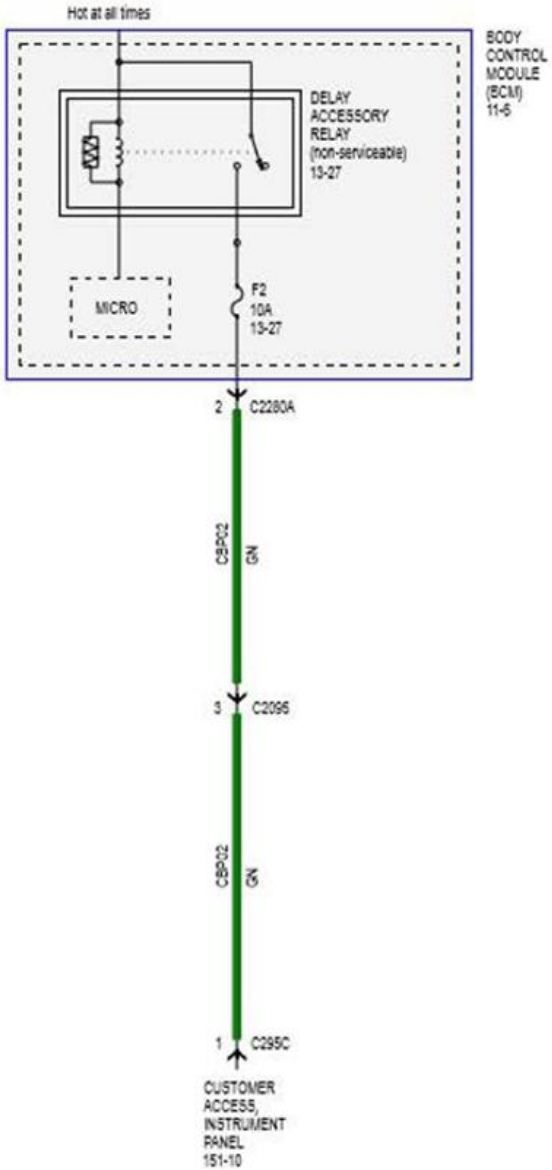
ELECTRICAL: CUSTOMER ACCESS CIRCUITS – TRAILER BRAKES CONTROLLER

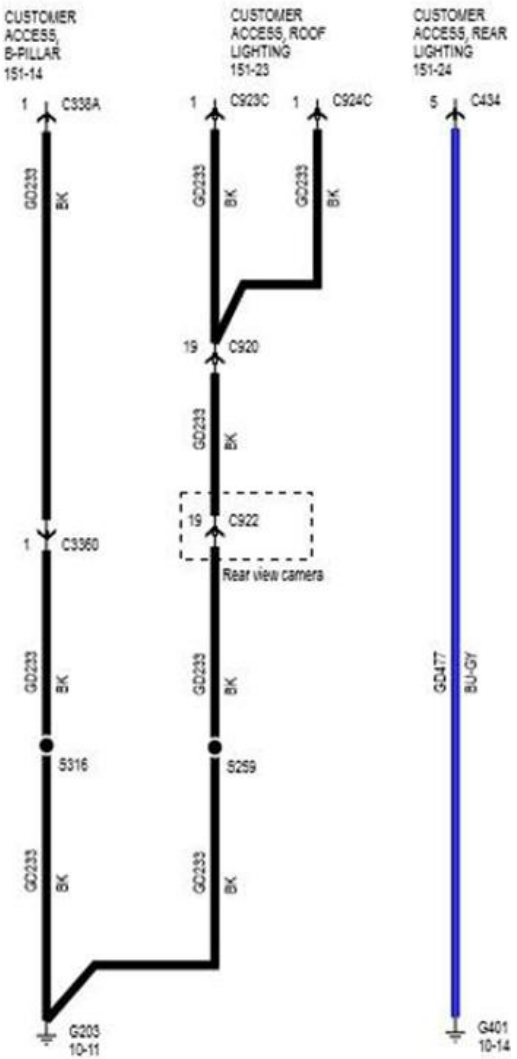


C239 14C210 – CUSTOMER ACCESS, TRAILER BRAKE CONTROLLER (PART# N/A)				
PIN	**CIRCUIT**	**GUAGE (AWG)**	**CIRCUIT FUNCTION**	**QUALIFIER**
1	-	-	NOT USED	
2	-	-	NOT USED	
3	GD216 (BK-VT)	15	GROUND – INSTRUMNET PANEL STRUCTURE # 3RD POINT	
4	-	-	NOT USED	
5	-	-	NOT USED	
6	-	-	NOT USED	
7	-	-	NOT USED	
8	SBB41 (RD)	9	FUSE – 41 OR CIRCUIT BREAKER	
9	-	-	NOT USED	
10	-	-	NOT USED	
11	-	-	NOT USED	
12	CBB95 (BN-BU)	20	FUSE – 30 OR CIRCUIT BREAKER	
13	-	-	NOT USED	
14	CAT19 (BU)	9	CTRL. MOD. – TRAILER TOW # BRAKES (COLOR TO SAE 1239)	

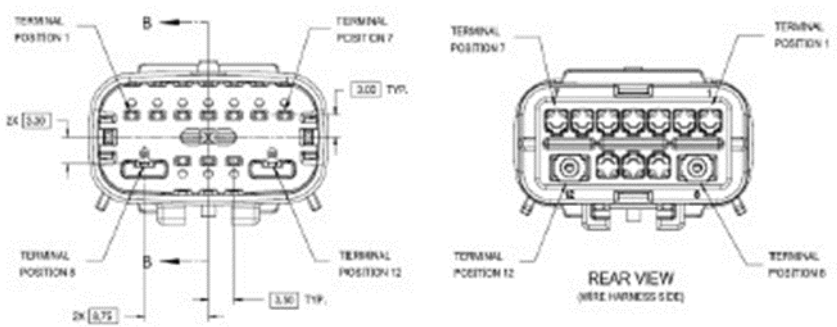


ELECTRICAL: CUSTOMER ACCESS CIRCUITS – REAR LIGHTING



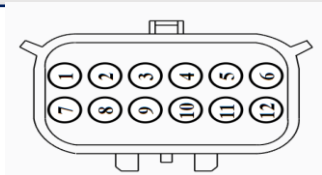


C 14406 – CUSTOMER ACCESS, REAR LIGHTING (PART# N/A)			
PIN	**CIRCUIT**	**GUAGE (AWG)**	**CIRCUIT FUNCTION**
1	CBB95 (BN/BU)	-	FUSE 95 OR CIRCUIT BREAKER
2	CLN18 (GY/YE)	-	BATT SAVE/DEMAND LAMP
3	CLS10 (GN/BN)	-	CTRL MOD REVERSE LAMPS ENGINE
4	CLS23 (GY/OG)	-	CTRL MOD LEFT REAR TURN LAMPS
5	CLS27 (GN/OG)	-	CTRL MOD RIGHT REAR TURN LAMPS
6	CLF61 (GY/BU)	-	CTRL MOD LEFT REAR STOP/TURN LAMPS
7	CLF62 (VT/WH)	-	CTRL MOD RIGHT REAR STOP/TURN LAMPS
8	SBB27 (BU/RD)	-	FUSE 27 OR CIRCUIT BREAKER
9	-	-	-
10	-	-	-
11	CLS05 (BU/GY)	-	PARK LAMPS ENGINE
12	CGD477	-	GND FRAME LEFT REAR



KU5T-14A624-BA

ELECTRICAL: CUSTOMER ACCESS CIRCUITS – ENGINE, SEIC, TRAILER BRAKE CONTROLLER, FRAME & TRAILER TOW

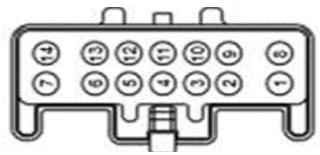


C
12A581 – CUSTOMER ACCESS, ENGINE, SEIC,PTO

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CE140 (BN)	22	CTRL MOD. POWERTRAIN # BATT CHARGE PROTECT INDICATOR (BCHPL) (BCPIL)
2	CE326 (BU-WH)	22	CTRL MOD. – POWERTRAIN # PTO OK INDICATORS PTO RELAY
3	CE912 (YE-GN)	22	SWITCH – PTO REQUEST 1 (PT) (PTORS1)
4	CE913 (BU)	22	CLEAN TACHOMETER TAKE OFF (CTO) (PTOIC)
5	CE926 (VT-BN)	22	SWITCH – BATT CHARGE PROTECT MODE (BCPSW)
6	CE933 (BU-OG)	22	SWITCH – PTO REQUEST 2 (PTORS2)
7	CET21 (GN-OG)	22	CTRL MOD. PTO TRANSMISSION RANGE OUTPUT NEUTRAL (TRO-N)
8	CET22 (GY-BN)	22	CTRL MOD. – POWERTRAIN # TRANSMISSION RANGE OUTPUT PARK (TRO-P)
9	LE423 (GN-WH)	22	CTRL MOD. – POWERTRAIN VOLTAGE REFERENCE ENGINE (VREF) (E-VREF_ (VREF 1)
10	RE405 (GN-WH)	22	CTRL MOD. – POWERTRAIN # SIGNAL RETRUN ENGINE (E-SIGRTN) (SIGNRTN-A)
11	VE925 (GN)	22	SWITCH – PTO RPM ADJUST (PTO_RPM)
12	VMC05 (VT-OG)	22	CTRL MOD. – VEHICLE SPEED OUTPUT (VSOUT)
13	VED32 (YE-GN)	22	CNG UPFIT PRIVATE CAN +
14	VED33 (GN-BU)	22	CNG UPFIT PROVATE CAN -

C494
14406 – CUSTOMER ACCESS, FRAME (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CAT14 (OG)	9	RELAY – TRAILER TOW BATT CHARGING (COLOR TO SAE 1239)
2	CAT03 (GY-BN)	16	CTRL MOD. – TRAILER TOW # BACKUP LAMPS
3	-	-	NOT USED
4	CAT19 (BU)	9	CTRL MOD. – TRAILER TOW # BRAKES (COLOR TO SAE 1239)



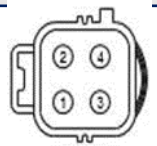
C239
14C210 – CUSTOMER ACCESS, TRAILER BRAKE CONTROLLER (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	-	-	NOT USED
2	-	-	NOT USED
3	GD216 (BK-VT)	15	GROUND – INSTRUMENT PANEL STRUCTURE # 3RD POINT
4	-	-	NOT USED
5	-	-	NOT USED
6	-	-	NOT USED
7	-	-	NOT USED
8	SBB41 (RD)	9	FUSE – 41 OR CIRCUIT BREAKER
9	-	-	NOT USED
10	-	-	NOT USED
11	-	-	NOT USED
12	CBB95 (BN-BU)	20	BOOFEED
13	-	-	NOT USED
14	CAT19 (BU)	9	CTRL MOD. – TRAILER TOW # BRAKES (COLOR TO SAE 1239)

C4098
14406 – TRAILER TOW CONNECTOR (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CAT09 (GN)	18	CTRL MOD. – TRAILER TOW # TURN SIGNAL RIGHT (COLOR TO SAE 1239)
2	CAT06 (YE)	18	CTRL MOD. – TRAILER TOW # TURN SIGNAL LEFT (COLOR TO SAE 1239)
3	CAT17 (BN)	15	RELAY – TRAILER TOW PARK LAMPS (COLOR TO SAE 1239)
4	RAT08 (WH)	15	CTRL MOD. – TRAILER TOW # RETRUN (USA ONLY, COLOR GROUND TO SAE 1239 EXCEPTION TO PSF)

ELECTRICAL: CUSTOMER ACCESS CIRCUITS – ENGINE, WIPER, POWER POINT, AUX. A/C, & A/C



C1764
12A581 – CUSTOMER ACCESS, ENGINE (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CBB54 (VT-OG)	9	FUSE – 54 OR CIRCUIT BREAKER
2	CAC17 (VT)	9	WIRE – UPFITTER CUSTOMER ACCESS #5
3	CAC18 (YE-GY)	9	WIRE – UPFITTER CUSTOMER ACCESS #6
4	SBB97 (RD)	5	FUSE – 97 OR CIRCUIT BREAKER

C3389
12A581 – CUSTOMER ACCESS, POWER POINT (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CBB56 (BU-GN)	14	FUSE – 56 OR CIRCUIT BREAKER
2	CBB12 (GN-WH)	14	FUSE – 12 OR CIRCUIT BREAKER
3	CBB58 (GY-OG)	20	FUSE – 58 OR CIRCUIT BREAKER
4	-	-	NOT USED

C234
12A581 – A/C (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CH302 (WH-BN)	16	CTRL MOD. – POWERTRAIN # A/C CLUTCH CONTROL RELAY / WOT AC CUTOFF (ACCR)
2	CH434 (GY-YE)	16	SWITCH – CLIMATE MODE # AC
3	CH421 (GY)	16	SWITCH – A/C COMPRESSOR CYCLING (ACCS)
4	CH302 (WH-BN)	16	CTRL MOD. – POWERTRAIN # A/C CLUTCH CONTROL RELAY / WOT AC CUTOFF (ACCR)

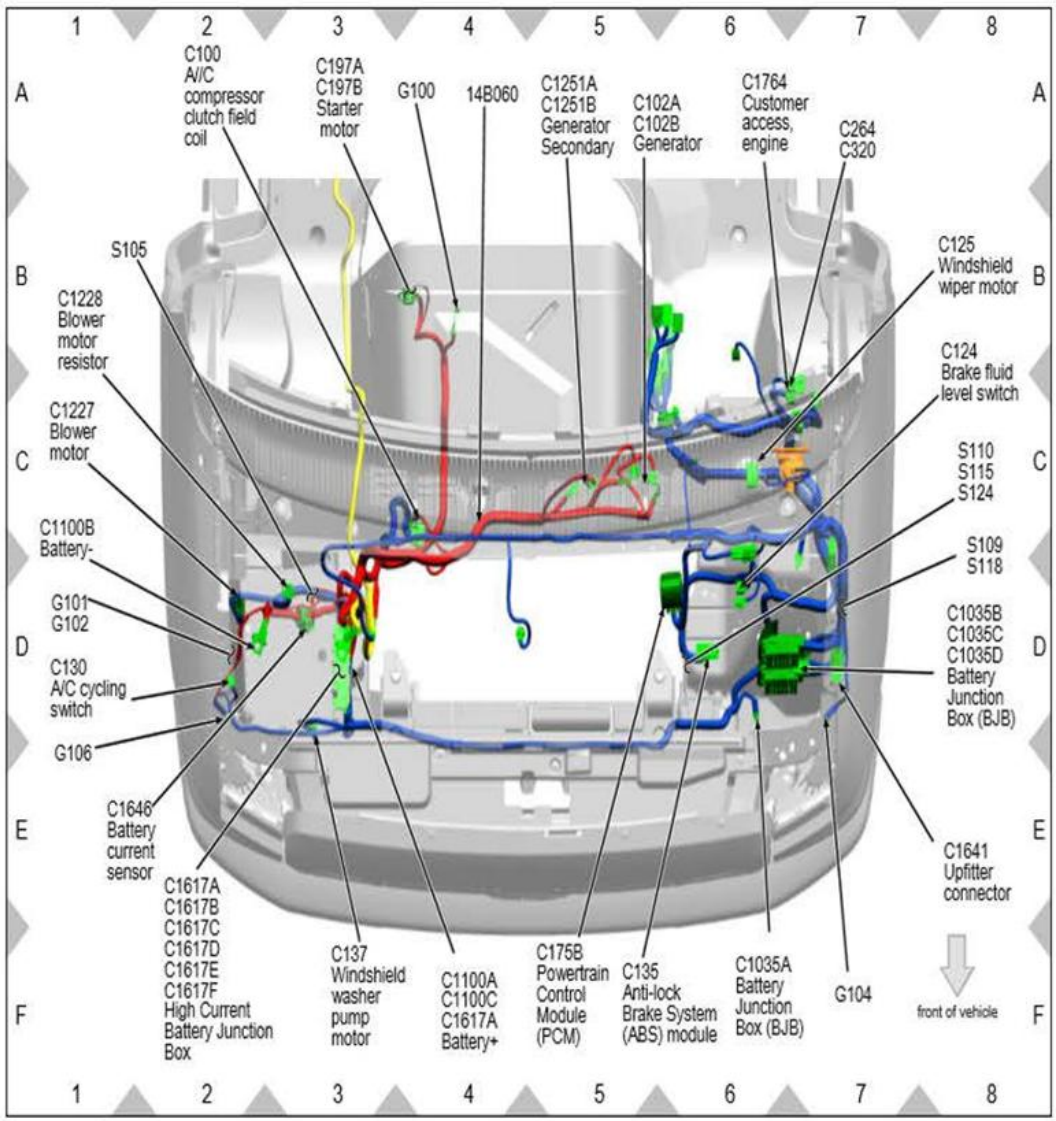
C2300
12A581 – CUSTOMER ACCESS, WIPER (PART# N/A)

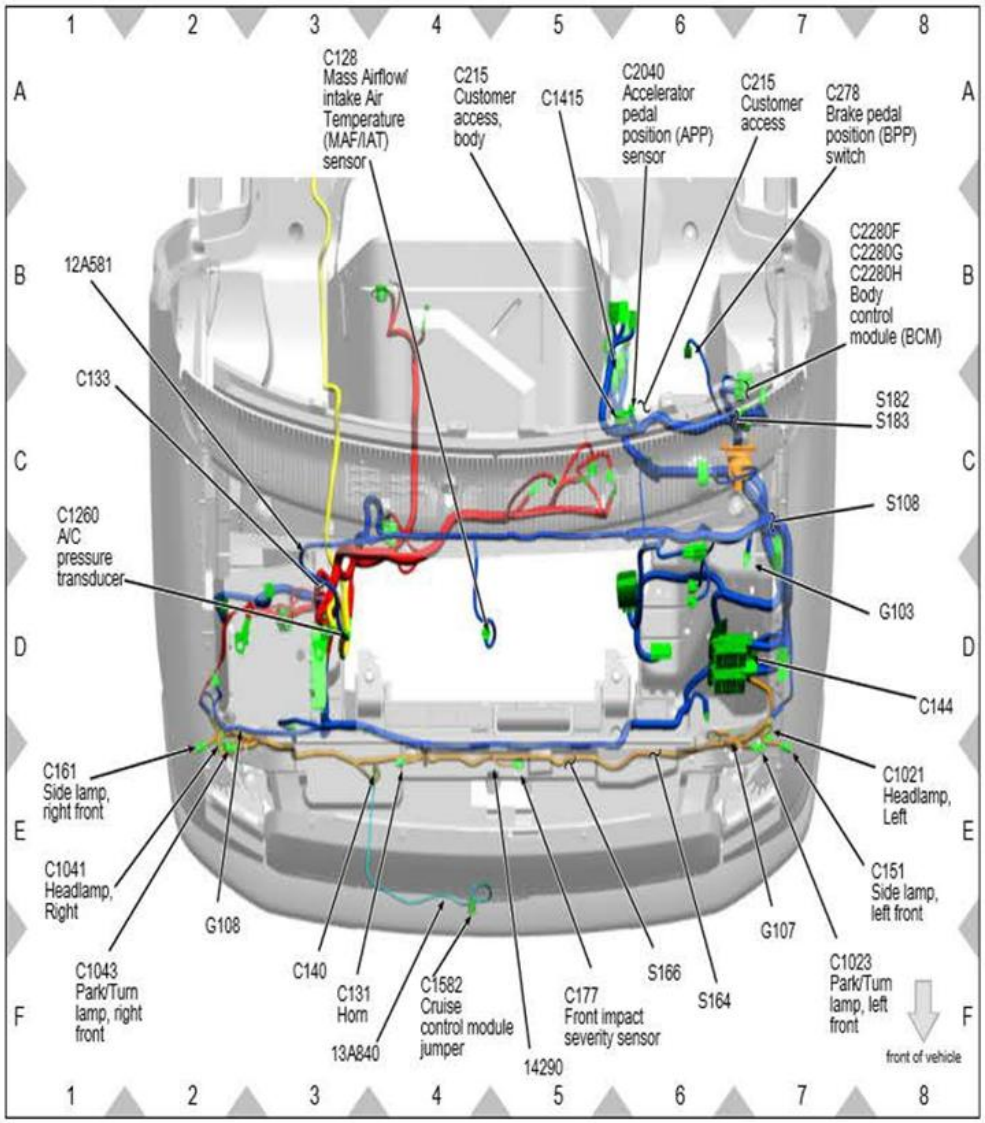
PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CRW03 (VT-WH)	12	RELAY – FRONT WIPER
2	CRW08 (VT-OG)	12	SWITCH – FRONT WIPER HIGH (H)
3	CRW16 (GY-BN)	12	CTRL MOD. – FRONT WIPER LOW
4	CRW14 (BU-WH)	18	CTRL MOD. – FRONT WASHER
5	CRW25 (BU-GY)	12	RELAY – FRONT WIPER PARK
6	GD122 (BK)	12	GROUND FENDER FRONT LEFT # 3RD POINT

C3358
14A005 – CUSTOMER ACCESS, AUX. A/C (PART# N/A)

PIN	CIRCUIT	GUAGE (AWG)	CIRCUIT FUNCTION
1	CHA07 (BU-GY)	9	SWITCH – AUX. BLOWER # POSIITON MEDIUM / MEDIUM LOW
2	CH435 (VT-GY)	20	SWITCH – CLIMATE MODE # BLOWER
3	GD233 (BK)	9	GROUND – COWL SIDE/PILLAR A LEFT
4	SBB52 (GN-RD)	9	FUSE – 53 OR CIRCUIT BREAKER
5	CHA08 (GN-OG)	20	SWITCH - AUX. BLOWER # POSIITON HIGH
6	CHA06 (YE-VT)	15	SWITCH – AUX. BLOWER # POSIITON LOW

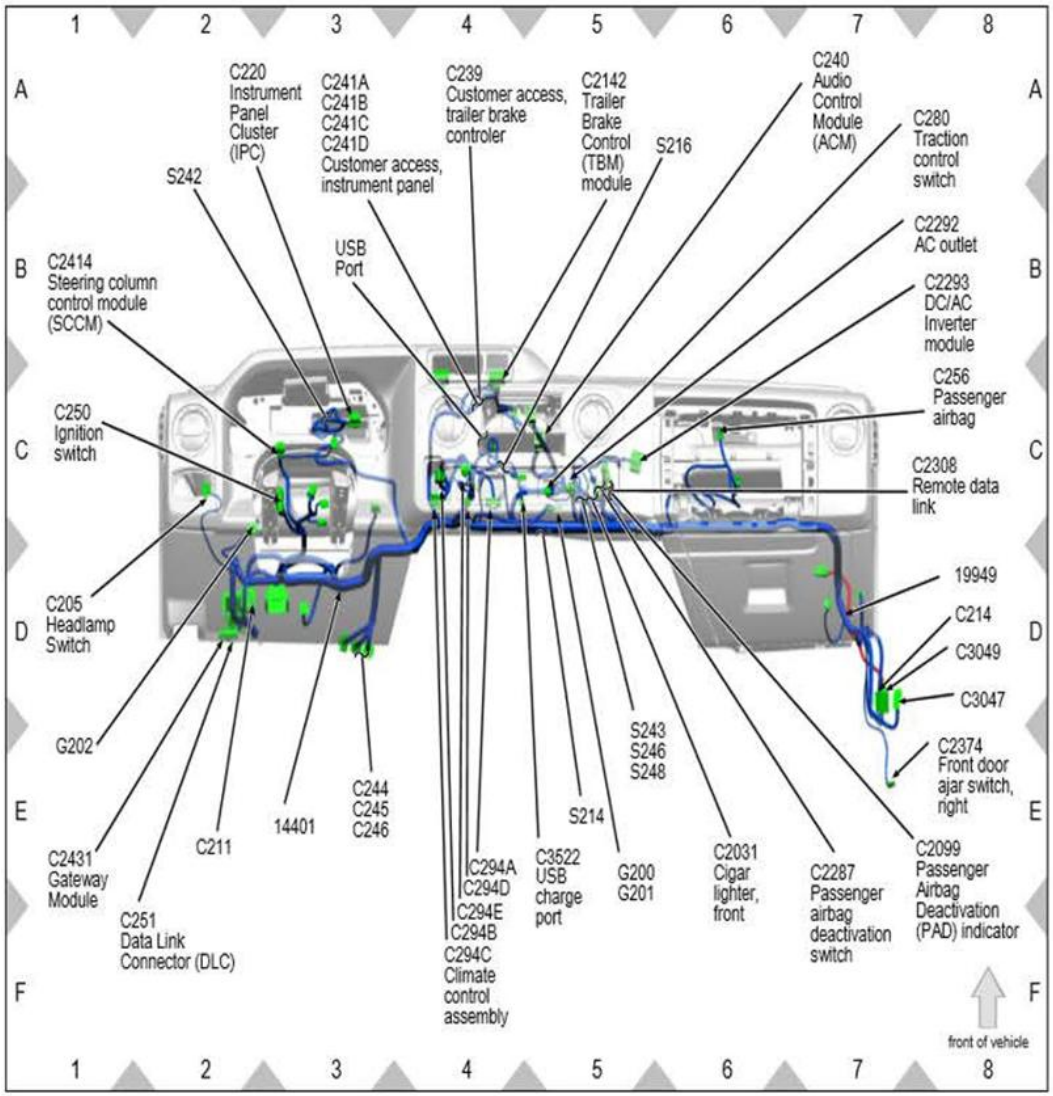
ELECTRICAL: WIRE HARNESS CONNECTOR LOCATIONS - CUTAWAY



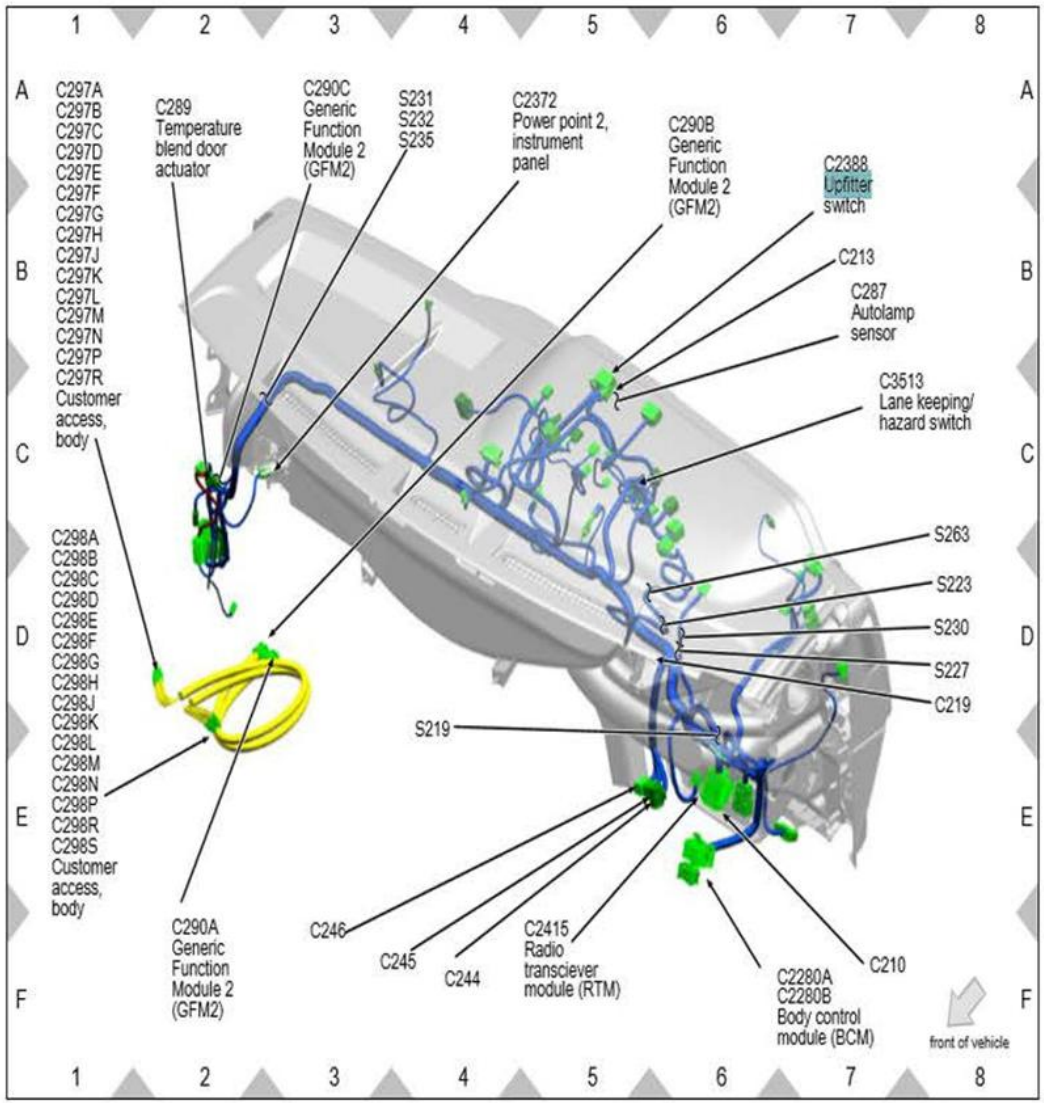


ENGINE COMPARTMENT - CUTAWAY

ELECTRICAL: WIRE HARNESS CONNECTOR LOCATIONS - CUTAWAY

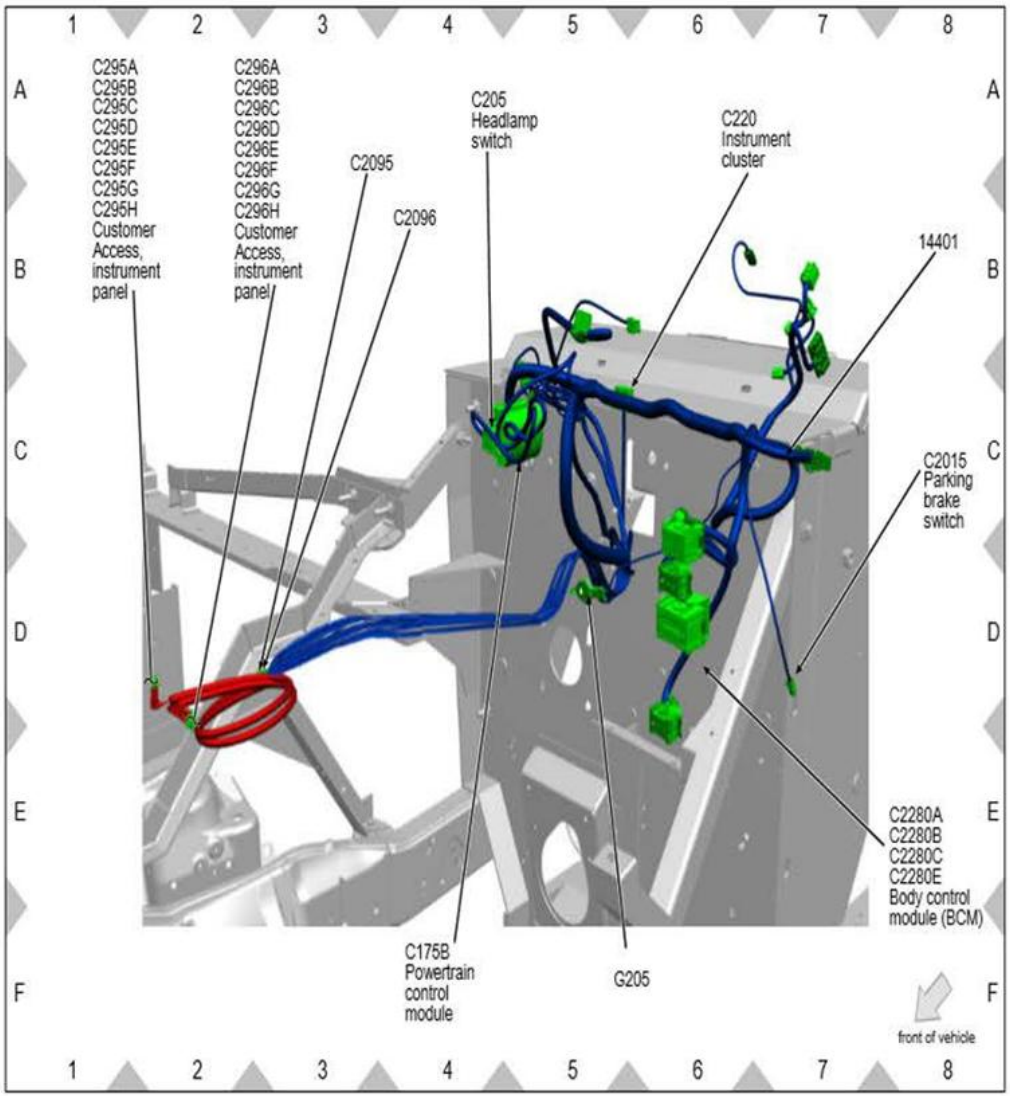


DASH PANEL - CUTAWAY

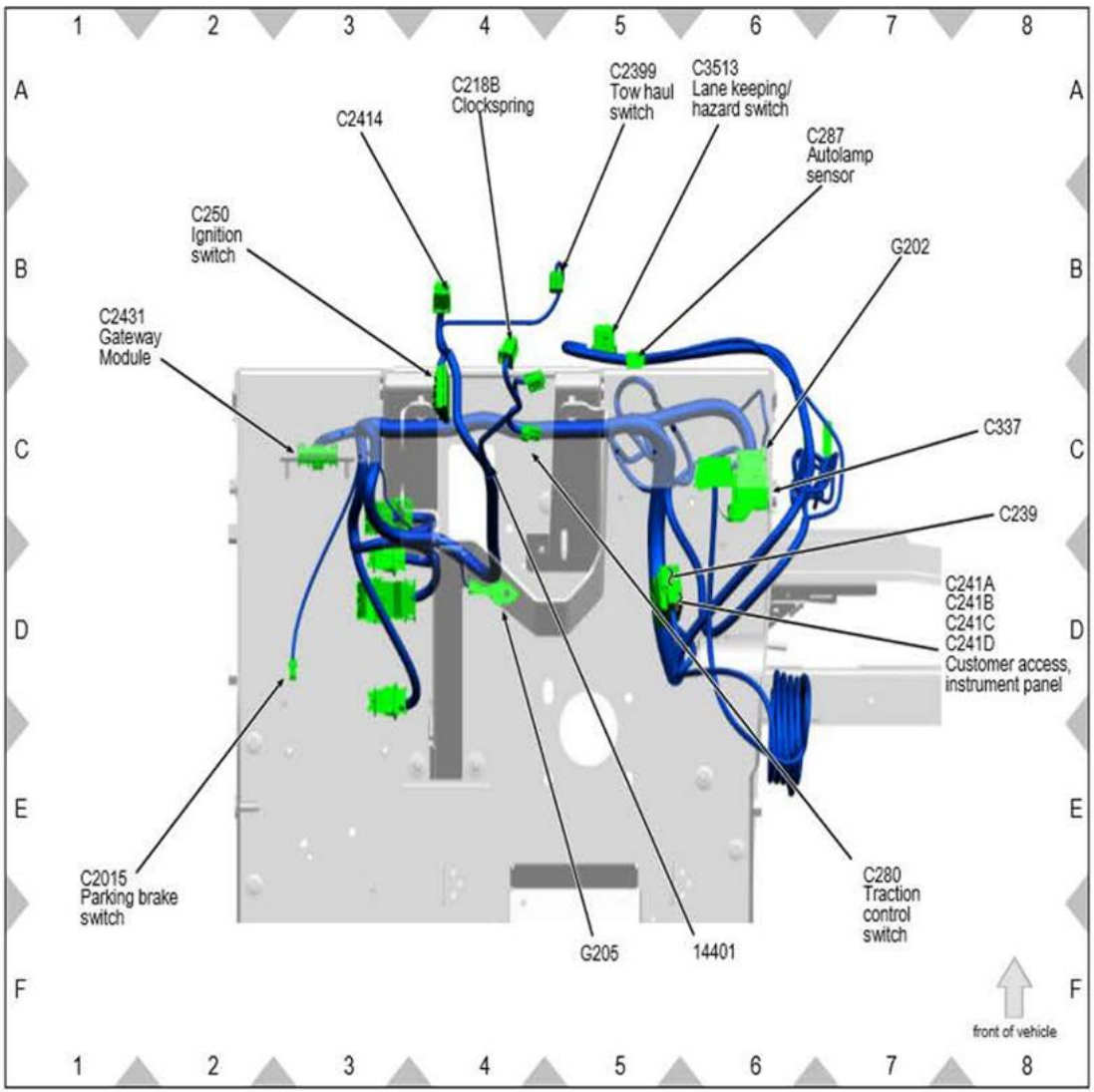

C297A C297B C297C C297D C297E C297F C297G C297H C297J C297K C297L C297M C297N C297P C297R Customer access, body
C289 Temperature blend door actuator
C290C Generic Function Module 2 (GFM2)
S231 S232 S235
C2372 Power point 2, instrument panel
C290B Generic Function Module 2 (GFM2)
C2388 Upfitter switch
C213
C287 Autolamp sensor
C3513 Lane keeping/ hazard switch
S263
S223
S230
S227
C219
C298A C298B C298C C298D C298E C298F C298G C298H C298J C298K C298L C298M C298N C298P C298R C298S Customer access, body
S219
C290A Generic Function Module 2 (GFM2)
C246
C245
C244
C2415 Radio transciever module (RTM)
C2280A C2280B Body control module (BCM)
C210
front of vehicle

BEHIND DASHPANEL - CUTAWAY

ELECTRICAL: WIRE HARNESS CONNECTOR LOCATIONS – STRIPPED CHASSIS



BEHIND DASHPANEL – STRIPPED CHASSIS



DASHPANEL – STRIPPED CHASSIS

ELECTRICAL: STATIONARY ELEVATED IDLE CONTROL & BATTERY CHARGE PROTECT (BCP)

OPERATING MODES:

Stationary Elevated Idle Control (SEIC) Mode

- Operates in Park at elevated engine speed.

- Intended to be commanded ONLY by applying battery voltage to certain customer-access blunt-cut wire circuits, and adding a target-speed resistor, and is only available when the vehicle road speed signal is zero
- Includes a circuit which changes from open-circuit to ground when enablers are met that may be used to turn on an indicator lamp while providing battery power to an aftermarket PTO clutch or solenoid
- Engine speed ramp-rates are configurable, by means of a Service tool, for all powertrains.
  - Default ramp-rate for all powertrains is 200 RPM/second.
  - Configurable ramp rates are as follows:
  - Gas: 100 – 1000 RPM/sec (in 100 RPM/sec increments)

Typical SEIC Engagement Sequence for TorqShift™ PTO

1. 12V is applied to PTQ REQ1 circuit.
2. PCM looks for the following enabling conditions:
   - Parking brake applied.
   - Foot off of service brake
   - Vehicle in PARK (or NEUTRAL)
   - Foot off of accelerator pedal
   - Vehicle speed is 0 mph (stationary)
   - Engine at a stable base idle speed
   - Transmission Oil Temp above 20° F
   - 7.3L - Engine Coolant Temperature (ECT) 20° F minimum.

BATTERY CHARGE PROTECT (BCP):

- When 12V is applied to the BCP SW circuit, the engine speed goes immediately to 600. From this state, the PCM uses battery voltage as well as ambient air temp., engine oil temperature information to raise engine speed higher to maintain battery charge. Maximum engine speed in BCP mode is 1200 rpm. Loss of an operating condition after BCP is engaged will require the BCP switch to be cycled before BCP will re-engage.
- BCP CANNOT BE ACTIVE WHEN SEIC OR PTO MODES ARE ACTIVE
- A Resistor must be installed between PTO REF and PTO RPM for both Diesel and Gasoline engines.

Typical Battery Charge Protect Mode Engagement Sequence:

1. 12V applied to BCP SW circuit
2. PCM looks for the following enabling conditions:
   - Parking brake applied.
   - Foot off of service brake
   - Vehicle in PARK (or NEURTRAL)
   - Foot off of accelerator pedal
   - Vehicle speed is 0 mph (stationary)
   - Engine at a stable base idle speed
   - Transmission Oil Temp above 20° F
   - 7.3L - Engine Coolant Temperature (ECT) 20° F minimum.
3. PCM looks for a valid voltage between 0.2 to 4.7 Volts on the PTO RPM circuit
4. Vehicle idle fluctuates slightly as PCM enters BCP mode
5. The BCP LP circuit changes from open-circuit to ground. This is intended to provide a ground path for a BCP indicator lamp

NOTE: BCP is a smart system. Engine idle will not increase unless the vehicle senses an increase in electrical demand. Under periods of low electrical demand, the operator may not notice any change in engine RPM. It is recommended that the modifier install an indicator lamp to alert the operator that BCP is properly engaged.

ADDITIONAL NOTES:

Adaptive Cooling

This PCM strategy automatically restricts engine power when it senses an over-temperature condition and may interrupt the SEIC-PTO operation. Typically, the over- temperature condition it reacts to will also show up on the temperature gage on the instrument panel. Elevated engine speed, typical of SEIC operation, may help avoid Adaptive Cooling occurrence due to the resultant additional engine and transmission coolant flow. However, depending on the auxiliary PTO power being demanded, 900 rpm may not be enough to prevent the power train from entering Adaptive Cooling mode, but 1500 rpm may.

Input Resistor

ALL modes (SEIC, PTO) require usage of an input resistor. The resistor value may be obtained in Tables A & B.

7.3L GASOLINE SEIC / BCP

VEHICLE CONDITIONS TO ENABLE SEIC (ALL ARE REQUIRED)	VEHICLE CONDITIONS THAT DISABLE SEIC (ANY ONE REQUIRED SEE NOTE - 1)	SEIC	BCP
Parking Brake Applied	Parking Brake Disengaged	Yes	Yes
Foot Off Of Service Brake	Depressing Service Brake	Yes	Yes
Vehicle In PARK	Vehicle Take Out Of PARK	Yes	Yes
Foot Off Of Accelerator Pedal	Accelerator Pedal Depressed	Yes	Yes
Vehicle Speed Is 0 MPH (Stationary)	Vehicle Speed Is Not 0 MPH (Stationary)	Yes	Yes
Engine At A Stable Base Idle Speed		Yes	Yes
Transmission Oil Temp. Above 20°F	Transmission Oil Temp. Exceeds 240°F.	Yes	Yes
Engine Coolant Temp. (ECT) 20° F Min. (6.7L)	Engine Coolant Temp. (ECT) Exceeds 230° F	Yes	No
Engine Coolant Temp. (ECT) 20° F Min. (7.3L)	Engine Coolant Temp. Limit (ECT) 230° F Max.	Yes	Yes
	Catalyst Temp. Limit	Yes	Yes

NOTE 1: A “change-of-state” at the “PTO REQ1” input (for Stationary Elevated Idle Control non-Split Shaft), or for both “PTO REQ1 and PTO REQ2” inputs (for Stationary Elevated Idle Control Split Shaft) is required to re-invoke Stationary Elevated Idle Control. When a disable is seen by the PCM, the Stationary Elevated Idle Control function is de-activated, the “PTO RELAY” output circuit changes from a “ground source” to “open-circuit”, and engine speed returns to base idle. To re-activate Stationary Elevated Idle Control, the operator must open the PTO Switch to the “PTO REQ1” and “PTO REQ2” inputs, then close the PTO Switch again to the “PTO REQ1” or “PTO REQ1 and PTO REQ2” inputs.

NOTE 2: A “change-of-state” at the “BCP SW” input is required to re-invoke Battery Charge Protect. When a disable is seen by the PCM, the Battery Charge Protect function is de-activated, the “BCP LP” output circuit changes from a “ground-source” to “open-circuit”, and engine speed returns to base idle. To re-activate Battery Charge Protect, the operator must open the Battery Charge Protect Switch to the “BCP SW” input, then close the Battery Charge Protect Switch again to

NOTE 3: See Split-Shaft Mode Description the “BCP SW” input.

ELECTRICAL: E- SERIES –SEIC,PTO 7.3L GAS ENGINE PCM CUSTOMER ACCESS

WIRE COLOR	WIRE TAG	CIRCUIT #	CIRCUIT INTENT	DESCRIPTION
YELLOW/GREEN	PTOREQ1	CE912	INPUT (VPWR)	**PCM PIN** •Applying vehicle battery voltage to this wire initiates SEIC **Stationary Mode** process. •Signals TorqShift™ transmission to enter SEIC Stationary Mode strategy. •Verifies safety enablers. •Turns off OBD and other emission-related monitoring. •Elevates engine speed to target found at PTO-RPM circuit. •Invokes the PTO relay circuit when safety enablers are met. •Looks for the target engine speed requested at the PTO_RPM circuit using a resistor or POT
BLUE/ORANGE	PTOREQ2	CE933	INPUT (VPWR)	**PCM PIN** •Applying vehicle battery voltage to this wire initiates **Mobile PTO Mode.** •Signals TorqShift™ transmission to enter Mobile mode strategy. •Verifies safety enablers. •Turns off OBD and other emission-related monitoring. •Invokes the PTO relay circuit when safety enablers are met. •Requires valid resistance on PTO_RPM input for system to function
BLUE/WHITE	PTORLY	CE326	OUTPUT	**PCM PIN** •A low-side driver, changing from "open-circuit" to "ground" indicating that the engine is ready for PTO operation to begin and that a PTO load may be applied. •Intended for powering a PTO indicator lamp or turn on a relay coil (not to exceed 1amp).LED lights require adding a resistor in series.
GREEN	PTO RPM	CE925	INPUT (resistor)	**PCM PIN** •Requires the addition of a resistor or potentiometer for any SEIC / PTO mode. •Resistor / potentiometer selection determines the fixed or variable engine target speed. •Combinein circuit with PTO_VREF (+5VDC). •Speed range available: 910 rpm to 2000 rpm
GREEN/VIOLET	PTO VREF	LE423	REFERENCE VOLTAGE	**PCM PIN** •A +5-volt reference, buffered against shorts to ground or power, used to complete the resistor circuit for engine speed selection.
GREEN/WHITE	SIGRTN_A	RE405	PCM GROUND	**PCM PIN** •A ground reference, buffered, used to complete the resistor circuit for engine speed selection.
VIOLET/ BROWN	BCP SW	CE926	INPUT (VPWR)	**PCM PIN** •Applying vehicle battery voltage to this wire begins BCP. •BCP regulates engine speed between 600 to 1200 rpm to maintain required charge system voltage
BROWN	BCPIL	CE140	OUTPUT	**PCM PIN** •A low-side driver, changing from "open-circuit" to "ground" indicating that BCP is in effect. •Intended for powering an LED lamp (40mA max.).

Note: see page 43 for Connector info

ELECTRICAL: STATIONARY ELEVATED IDLE CONTROL & BATTERY CHARGE PROTECT (BCP)

OPERATING MODES:

Stationary Elevated Idle Control (SEIC) Mode

- Operates in Park at elevated engine speed.

- Intended to be commanded ONLY by applying battery voltage to certain customer-access blunt-cut wire circuits, and adding a target-speed resistor, and is only available when the vehicle road speed signal is zero
- Includes a circuit which changes from open-circuit to ground when enablers are met that may be used to turn on an indicator lamp while providing battery power to an aftermarket PTO clutch or solenoid
- Engine speed ramp-rates are configurable, by means of a Service tool, for all powertrains.
  - Default ramp-rate for all powertrains is 200 RPM/second.
  - Configurable ramp rates are as follows:
  - Gas: 100 – 1000 RPM/sec (in 100 RPM/sec increments)

Typical SEIC Engagement Sequence for TorqShift™ PTO

1. 12V is applied to PTQ REQ1 circuit.
2. PCM looks for the following enabling conditions:
   - Parking brake applied.
   - Foot off of service brake
   - Vehicle in PARK (or NEUTRAL)
   - Foot off of accelerator pedal
   - Vehicle speed is 0 mph (stationary)
   - Engine at a stable base idle speed
   - Transmission Oil Temp above 20° F
   - 7.3L - Engine Coolant Temperature (ECT) 20° F minimum.

BATTERY CHARGE PROTECT (BCP):

- When 12V is applied to the BCP SW circuit, the engine speed goes immediately to 600. From this state, the PCM uses battery voltage as well as ambient air temp., engine oil temperature information to raise engine speed higher to maintain battery charge. Maximum engine speed in BCP mode is 1200 rpm. Loss of an operating condition after BCP is engaged will require the BCP switch to be cycled before BCP will re-engage.
- BCP CANNOT BE ACTIVE WHEN SEIC OR PTO MODES ARE ACTIVE
- A Resistor must be installed between PTO REF and PTO RPM for both Diesel and Gasoline engines.

Typical Battery Charge Protect Mode Engagement Sequence:

1. 12V applied to BCP SW circuit
2. PCM looks for the following enabling conditions:
   - Parking brake applied.
   - Foot off of service brake
   - Vehicle in PARK (or NEURTRAL)
   - Foot off of accelerator pedal
   - Vehicle speed is 0 mph (stationary)
   - Engine at a stable base idle speed
   - Transmission Oil Temp above 20° F
   - 7.3L - Engine Coolant Temperature (ECT) 20° F minimum.
3. PCM looks for a valid voltage between 0.2 to 4.7 Volts on the PTO RPM circuit
4. Vehicle idle fluctuates slightly as PCM enters BCP mode
5. The BCP LP circuit changes from open-circuit to ground. This is intended to provide a ground path for a BCP indicator lamp

NOTE: BCP is a smart system. Engine idle will not increase unless the vehicle senses an increase in electrical demand. Under periods of low electrical demand, the operator may not notice any change in engine RPM. It is recommended that the modifier install an indicator lamp to alert the operator that BCP is properly engaged.

ADDITIONAL NOTES:

Adaptive Cooling

This PCM strategy automatically restricts engine power when it senses an over-temperature condition and may interrupt the SEIC-PTO operation. Typically, the over- temperature condition it reacts to will also show up on the temperature gage on the instrument panel. Elevated engine speed, typical of SEIC operation, may help avoid Adaptive Cooling occurrence due to the resultant additional engine and transmission coolant flow. However, depending on the auxiliary PTO power being demanded, 900 rpm may not be enough to prevent the power train from entering Adaptive Cooling mode, but 1500 rpm may.

Input Resistor

ALL modes (SEIC, PTO) require usage of an input resistor. The resistor value may be obtained in Tables A & B.

7.3L GASOLINE SEIC / BCP

VEHICLE CONDITIONS TO ENABLE SEIC (ALL ARE REQUIRED)	VEHICLE CONDITIONS THAT DISABLE SEIC (ANY ONE REQUIRED SEE NOTE - 1)	SEIC	BCP
Parking Brake Applied	Parking Brake Disengaged	Yes	Yes
Foot Off Of Service Brake	Depressing Service Brake	Yes	Yes
Vehicle In PARK	Vehicle Take Out Of PARK	Yes	Yes
Foot Off Of Accelerator Pedal	Accelerator Pedal Depressed	Yes	Yes
Vehicle Speed Is 0 MPH (Stationary)	Vehicle Speed Is Not 0 MPH (Stationary)	Yes	Yes
Engine At A Stable Base Idle Speed		Yes	Yes
Transmission Oil Temp. Above 20°F	Transmission Oil Temp. Exceeds 240°F.	Yes	Yes
Engine Coolant Temp. (ECT) 20° F Min. (6.7L)	Engine Coolant Temp. (ECT) Exceeds 230° F	Yes	No
Engine Coolant Temp. (ECT) 20° F Min. (7.3L)	Engine Coolant Temp. Limit (ECT) 230° F Max.	Yes	Yes
	Catalyst Temp. Limit	Yes	Yes

NOTE 1: A “change-of-state” at the “PTO REQ1” input (for Stationary Elevated Idle Control non-Split Shaft), or for both “PTO REQ1 and PTO REQ2” inputs (for Stationary Elevated Idle Control Split Shaft) is required to re-invoke Stationary Elevated Idle Control. When a disable is seen by the PCM, the Stationary Elevated Idle Control function is de-activated, the “PTO RELAY” output circuit changes from a “ground source” to “open-circuit”, and engine speed returns to base idle. To re-activate Stationary Elevated Idle Control, the operator must open the PTO Switch to the “PTO REQ1” and “PTO REQ2” inputs, then close the PTO Switch again to the “PTO REQ1” or “PTO REQ1 and PTO REQ2” inputs.

NOTE 2: A “change-of-state” at the “BCP SW” input is required to re-invoke Battery Charge Protect. When a disable is seen by the PCM, the Battery Charge Protect function is de-activated, the “BCP LP” output circuit changes from a “ground-source” to “open-circuit”, and engine speed returns to base idle. To re-activate Battery Charge Protect, the operator must open the Battery Charge Protect Switch to the “BCP SW” input, then close the Battery Charge Protect Switch again to

NOTE 3: See Split-Shaft Mode Description the “BCP SW” input.

ELECTRICAL: E- SERIES –SEIC, PTO 7.3L GAS ENGINE PCM CUSTOMER ACCESS

WIRE COLOR	WIRE TAG	CIRCUIT #	CIRCUIT INTENT	DESCRIPTION
YELLOW/GREEN	PTOREQ1	CE912	INPUT (VPWR)	**PCM PIN** •Applying vehicle battery voltage to this wire initiates SEIC **Stationary Mode** process. •Signals TorqShift™ transmission to enter SEIC Stationary Mode strategy. •Verifies safety enablers. •Turns off OBD and other emission-related monitoring. •Elevates engine speed to target found at PTO-RPM circuit. •Invokes the PTO relay circuit when safety enablers are met. •Looks for the target engine speed requested at the PTO_RPM circuit using a resistor or POT
BLUE/ORANGE	PTOREQ2	CE933	INPUT (VPWR)	**PCM PIN** •Applying vehicle battery voltage to this wire initiates **Mobile PTO Mode.** •Signals TorqShift™ transmission to enter Mobile mode strategy. •Verifies safety enablers. •Turns off OBD and other emission-related monitoring. •Invokes the PTO relay circuit when safety enablers are met. •Requires valid resistance on PTO_RPM input for system to function
BLUE/WHITE	PTORLY	CE326	OUTPUT	**PCM PIN** •A low-side driver, changing from "open-circuit" to "ground" indicating that the engine is ready for PTO operation to begin and that a PTO load may be applied. •Intended for powering a PTO indicator lamp or turn on a relay coil (not to exceed 1amp).LED lights require adding a resistor in series.
GREEN	PTO RPM	CE925	INPUT (resistor)	**PCM PIN** •Requires the addition of a resistor or potentiometer for any SEIC / PTO mode. •Resistor / potentiometer selection determines the fixed or variable engine target speed. •Combinein circuit with PTO_VREF (+5VDC). •Speed range available: 910 rpm to 2000 rpm
GREEN/VIOLET	PTO VREF	LE423	REFERENCE VOLTAGE	**PCM PIN** •A +5-volt reference, buffered against shorts to ground or power, used to complete the resistor circuit for engine speed selection.
GREEN/WHITE	SIGRTN_A	RE405	PCM GROUND	**PCM PIN** •A ground reference, buffered, used to complete the resistor circuit for engine speed selection.
VIOLET/ BROWN	BCP SW	CE926	INPUT (VPWR)	**PCM PIN** •Applying vehicle battery voltage to this wire begins BCP. •BCP regulates engine speed between 600 to 1200 rpm to maintain required charge system voltage
BROWN	BCPIL	CE140	OUTPUT	**PCM PIN** •A low-side driver, changing from "open-circuit" to "ground" indicating that BCP is in effect. •Intended for powering an LED lamp (40mA max.).

Note: see page 43 for Connector info

ELECTRICAL: E- SERIES –SEIC, PTO 7 .3L GAS ENGINE CUSTOMER ACCESS

WIRE COLOR	WIRE TAG	CIRCUIT #	CIRCUIT INTENT	DESCRIPTION
GRAY / BROWN	TRO P	CET22	OUTPUT PARK-Only	- An o utput fro m the PCM that indicates when the Transmissio n Range Sensor is indicating that the Transmission is in the Park Position. The Low Side driver (160mA max.) in the PCM will pull this output to ground when active (Transmission is in the PARK Position). To properly reference this output, the customer supplied external controller/device needs to pull this output up to VPWR with a 680 Ohm resistor. Thus, when the output is active, the voltage at this output will be 0 Volts. When this output is not active, the output will be pulled up to VPWR by the 680 Ohm pull up resistor. E47
GREEN/ ORANGE	TRO N	CET21	OUTPUT NEUTRA L-Only	- An output from the PCM that indicates when the Transmission Range Sensor is indicating that the Transmission is in the Neutral Position. The Low Side driver (160mA max.) in the PCM will pull this output to ground when active (Transmission is in the Neutral Position). To properly reference this output, the customer supplied external controller/device needs to pull this output up to VPWR with a 680 Ohm resistor. Thus, when the output is active, the voltage at this output will be 0 volts. When this output is not active, the output will be 'pulled up to VPWR by the 680 Ohm pull up resistor.
VIOLET/ ORANGE	VS OUT	VM C05	OUTPUT Vehicle Speed	- An output from the PCM that provides 8000 pulses per mile signal with a 50% duty cycle. The low side driver in the PCM will switch the output off and on (off will allow the output to be pulled up close to VPWR), (ON will put the output to 0 Volts).
BLUE	CTO	CE913	OUTPUT Engine Speed	- An output fro m the PCM that indicates a Clean Tacho meter Output to pro vide an indicatio n of engine RPM . The low side driver in the PCM will switch the output off and on (off will allow the output to be pulled up close to VPWR), (on will put the output to 0 volts), at a Frequency = ((Engine RPM ' s * Number of cylinders) / 120), with a duty cycle of 50%. The customer-supplied external controller should have a high-impedance input such that it does not impact the PCM 's ability to provide a Clean Tach Out signal.
WHITE/VIO LET	PARK BRAKE	CM C25	OUTPUT Park Brake	- Gro und Output Signal wire NOTE: The Body Control Module (BCM) park brake input also uses this signal. The BCM park brake input cannot source any current. The body builder must provide a high impedance circuit (such as a Field Effect Transistorr) with a 20 kilo-ohm or larger resistor to prevent faulting the Body Control Module. See schematic in the Body Builder Layout Book.

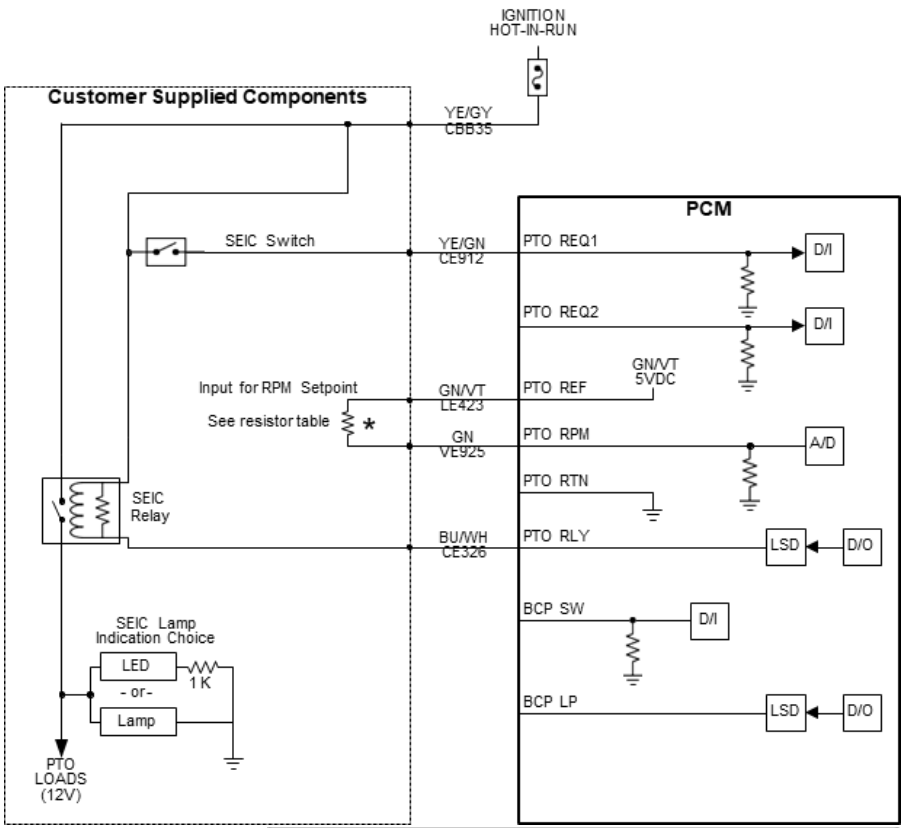
Note: see page 43 for Connector info

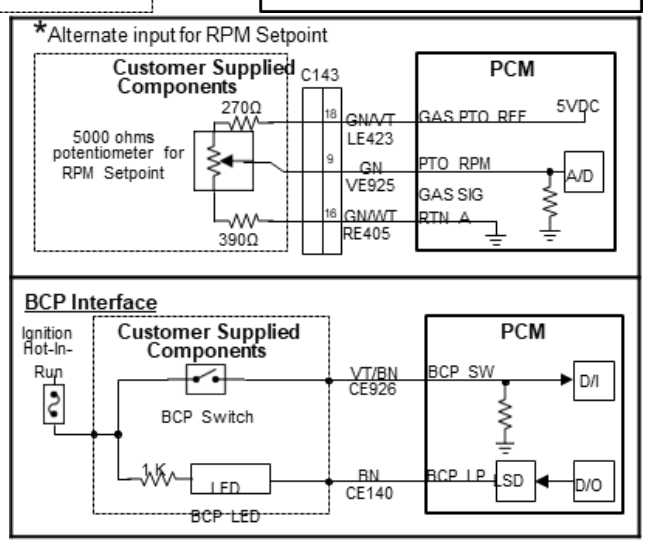
SEIC / PTO RESISTOR TABLES 0.10 VOLTAGE INCREMENTS – 7.3L GAS

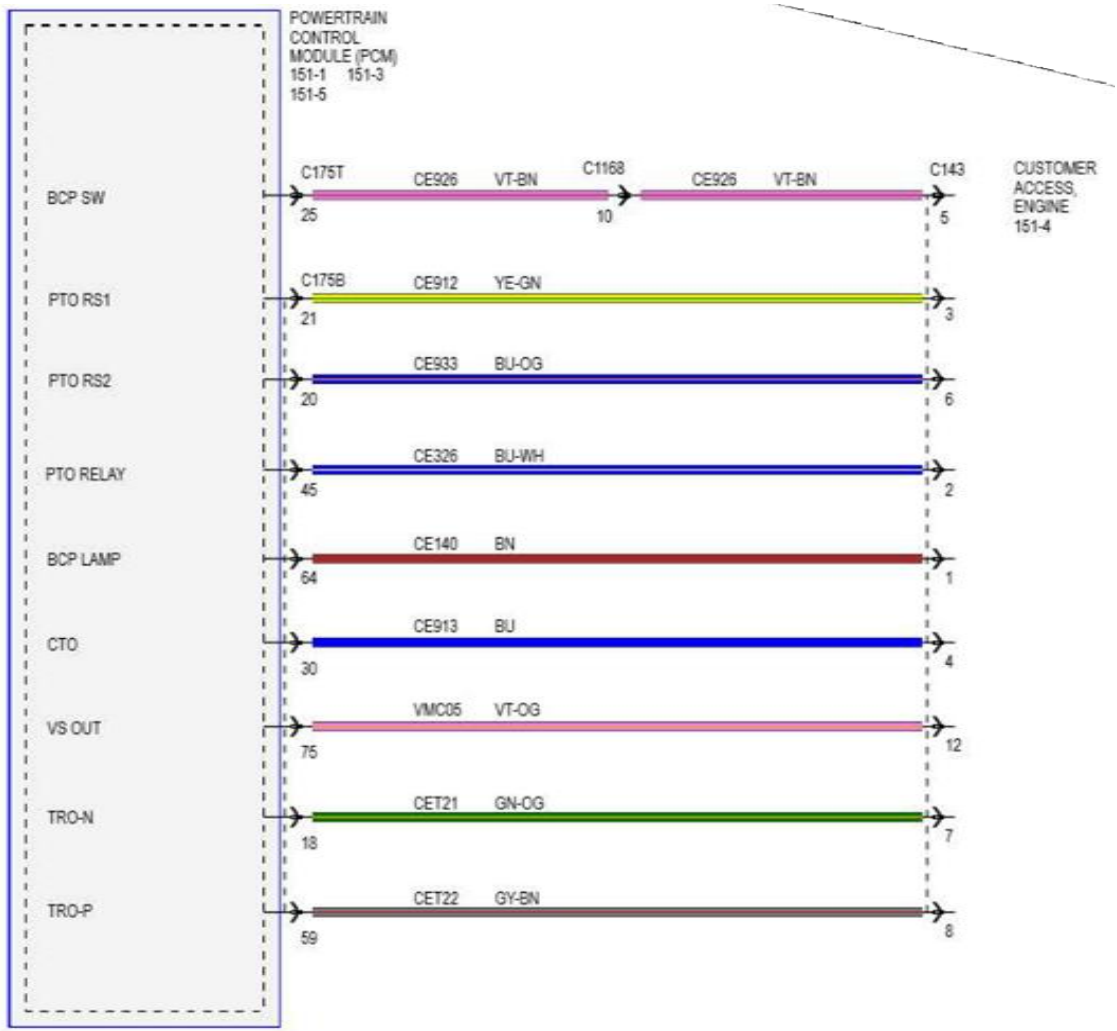
GAS RESISTOR CHART (0.1 VOLT RESISTOR CHART)			
GAS RESISTOR CHART	PTO_RPM Input Voltage	Resistor	GAS SEIC PTO Engine RPM
Voltage Out-Of-Range LOW	0	N/A	N/A
	0.1	N/A	N/A
	0.2	N/A	N/A
Voltage Dead Band	0.3	73633	700
Usable Voltage Range	0.4	54050	700
	0.5	42300	743
	0.6	34467	785
	0.7	28871	828
	0.8	24675	870
	0.9	21411	913
	1	18800	955
	1.1	16664	998
	1.2	14883	1040
	1.3	13377	1083
	1.4	12086	1125
	1.5	10967	1168
	1.6	9988	1210
	1.7	9124	1253
	1.8	8356	1295
	1.9	7668	1338
	2	7050	1380
	2.1	6490	1423
	2.2	5982	1465
	2.3	5517	1508
	2.4	5092	1550
	2.5	4700	1593
	2.6	4338	1635
	2.7	4004	1678
	2.8	3693	1720
	2.9	3403	1763
	3	3133	1805
	3.1	2881	1848
	3.2	2644	1890
	3.3	2421	1933
	3.4	2212	1975
	3.46	2094	2000
Voltage Dead Band	3.5	2014	2000
	3.6	1828	2000
Voltage Out Of Range HIGH	3.7	N/A	N/A
	3.8	N/A	N/A
	3.9	N/A	N/A
	4	N/A	N/A

GAS RESISTOR CHART (100 RPM RESISTOR CHART)		
7.3L Gas Stationary		
ENGINE TARGET	RESISTOR	VOLTAGE
700	54050	0.4
800	32291	0.64
900	22293	0.87
1000	16550	1.11
1100	12822	1.34
1200	10207	1.58
1300	8271	1.81
1400	6780	2.05
1500	5596	2.28
1600	4634	2.52
1700	3836	2.75
1800	3164	2.99
1900	2590	3.22
2000	2094	3.46

ELECTRICAL: SEIC & BCP INTERFACE E-SERIES 7.3L GAS







FORD CO-PILOT360™ TECHNOLOGY

Ford Co-Pilot360™
Ford Co-Pilot360 is a collection of advanced driver-assist (ADAS) features designed to help drivers feel confident and in command on the road. These smart features can help drivers be more aware of their surroundings, provide alerts about surprises on the road and help to avoid potential collisions while navigating the road ahead.

Forward facing ADAS features are enabled by either a windshield mounted camera, or a combination of camera and bumper mounted radar module

For E-Series:
Stripped Chassis have neither windshield mounted camera nor bumper mounted radar.
Cutaways have windshield mounted camera unless ESC Delete (order code 43D) or AEB Delete (order code 53A) is selected.
Cutaways with the optional Driver's Safety Package (Order Code 526) will also have a bumper mounted radar.

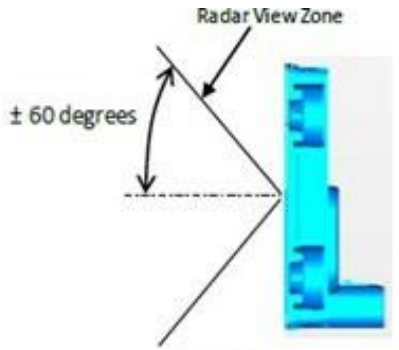
Installed upfitter equipment should not infringe on the radar or camera view zones. The CAD files of the radar and camera view zones are available upon request via the Ford BBAS web site
https://www.fordpro.com/en-us/upfit/contact-us/

IMPORTANT
- Not recommend relocating camera or radar
- ADAS hardware cannot be added to vehicle post production.
- Verify location when using aftermarket hood mounted mirrors which could possibly interfere with camera "field of view"
- Not recommend equipping vehicles with winch systems, cones, cables, license plates (center) which could possibly obstruct/interfere with radar and camera "field of view"
- Not recommend applying paint or decals to radar or cover which could possibly obstruct/ interfere radar field of view
- Not recommend applying decals or objects to the front of windshield which could possibly obstruct/ interfere camera "field of view." Over roof systems that extend forward of windshield ensure that it does not interfere with camera "field of view".
- Not recommend using aftermarket suspension components (e.g. Adding air ride, helper springs, lift kits, etc.) Which could possibly obstruct/ interfere radar and camera field of view zones
- Not recommend using front bumper system to push other objects/vehicles this is to prevent any damage or misalignment to radar and cover.
- Not recommend modifying or replacing factory equipped bumper with aftermarket sourced bumpers which may interfere with radar "field of view".
- If the camera or radar is blocked due to accumulation of dirt, ice, or snow in "field of view" - vehicle will display blockage message in cluster. Once blockage is removed, blockage message will stop being displayed

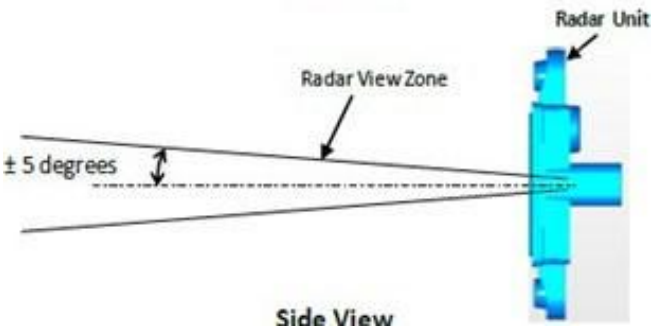
- Snowplow equipped vehicles will have a feature in cluster to turnoff ADAS.
- Radar should not be moved or adjusted from "as built" location and alignment, unless the attitude or ride height is significantly altered.
- Location of radar and camera on the e-series are fixed.
- The intermediate/final stage manufacturer is responsible for verifying that the lane keeping system camera sensor is properly calibrated within ford specifications once vehicles are completed.

NOTE: THE INTERMEDIATE/FINAL STAGE MANUFACTURER IS RESPONSIBLE FOR VERIFYING THAT THE LANE KEEPING SYSTEM CAMERA SENSOR IS PROPERLY CALIBRATED WITHIN FORD SPECIFICATIONS ONCE VEHICLES ARE COMPLETED.

CAMERA – 'FIELD OF VIEW'
(CAD File:VN127_ADAS_CAMERA_FOV.stp)



Plan View



Side View

https://www.fordpro.com/en-us/upfit/publications/

CHANGE CONTROL

- Updated Camera FOV CAD File Name 03/18/2025
- Updated SEIC RPM Limits 01/30/2026